AN

ENQUIRY
INTO THE
INFLUENCE
OF THE
ELECTRIC-FLUID,
IN THE
STRUCTURE and FORMATION
OF
ANIMATED BEINGS.

By MARMADUKE BERDOE,
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> " Depuis la chenille juſqù au papillon: depuis le
> " ver ſpermatique juſqù a l'homme, il ſemble
> " qùil y àvoit quelqù analogie."
>
> *Venus Phiſique*. C. 4.

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BRITISH MUSEUM

TO

Thomas Manſell Talbot, Eſq.

Of MARGAM,

In the County of GLAMORGAN,

The following Sheets are inſcribed,
as a Proof of ſincere Friendſhip
and Eſteem, by

His much obliged,

And very obedient Servant,

MARMADUKE BERDOE.

MILSOM-STREET,
BATH.

PREFACE.

AN invincible deſire led me through many diſadvantages to the ſtudy of phyſic; the ſame ardent inclination engages me to take up the profeſſion of a phyſician, although at a manifeſt diſadvantage to my fortune. Obliged, as I have been, to trace out myſelf the way through the intricate paths of the medical art, I was ſurpriſed to find ſo little uniformity in the practice and theory of phyſicians. With ſome, the acrimony of the humors, the *ſtrictum*, or the *laxum*; with others the repletion or inanition of the veſſels; were the cauſes of the ſeveral diſorders which were incident to human nature. Uncertain and doubtful I endeavored to diſcover the ſource of theſe variations. I could not perſuade myſelf that the bodies of animals were governed by the ſame laws, or work'd by the ſame powers as hydraulic machines: or that the principles of phyſiology were founded on experimental philoſophy.

Theſe reflections induced me to think, that the doctrine of the once celebrated Boerhaave was the ſource of that evil which I ſo much wiſhed to avoid. What I had at preſent acquired ſeem'd to be a mixture of mechanical and chymical knowledge, and as the one or the other prevailed, I became eager for frequent bleeding or purging. In this undetermined ſtate I left Leyden, the German, and Flemiſh ſchools. Being arrived at Paris, chance brought me acquainted with a ſect of phyſicians, who had ſhook off the errors of Boerhaave's doctrine, and had reſolved to take nature only for their guide, and to confirm their theory by clinical obſervation. With them I became full of veneration for the names of Hippocrates, Duretius, Hollerius and Baillou. Perſuaded that the excellence of a phyſician did not conſiſt in a knowledge of the imaginary laws of circulation, or in vain conjectures on the force of muſcles. In ſhort, I learn'd to doubt. I became acquainted with the works, and ſome of the authors. Full of reſpect for Meſſrs. de Bordeu, La Caze, Fouquet, Robert, Michel, Barthes and the celebrated M. Vennel. I reſolved to follow their ſteps, and improve upon their plan as I found occaſion. My firſt attempt I humbly ſubmit to the public inſpection, in the following ſmall treatiſe.

INTRODUCTION.

THE circle of this globe comprehends the two different ſubſtances of earth and water. Hence the name of *terraqueous* globe. Philoſophers have ever been divided in their opinions concerning their formation. They have been undetermined likewiſe as to the primitive matter, that is to ſay, if the earth has formed the waters, or the waters form'd the earth. The general ſyſtem of our modern philoſophy teaches us to believe that the earth was the ſource of animated exiſtence, and of the waters. On

6

the contrary, we may obſerve in the moſt early ages, (as we may remark in the Syncellian chronicle) lived a certain Magi, named Beroſa, the father of Belus of Babylon, a man celebrated for his knowledge; who aſſerted, when ſpeaking of the origin and production of the world, "There was a time when water and darkneſs were the only principles in nature, *from* them every thing was formed, and *in* them every different animal took its birth." The Brachmans, who were the only philoſophers of the Indians, maintained that the world drew its origin from water. The celebrated Homer, who was equally philoſopher and poet, has ſaid, that every thing in nature deriv'd its origin from water. Pliny mentions ſomething to this purpoſe, ſo does Plutarch. Thales, the author of the Ionic ſect, who was held in the greateſt eſteem by the Greeks, ſaid that water was the production of every thing: and if we may credit Diogenes, Laertius and Cicero, he aſſerted that God was the ſpirit which formed every thing from water. M. de Maillet, a late French author, has attempted to prove this ſuppoſition, and has publiſhed ſome very uncommon obſervations concerning it.

Leaving all controverſy, I ſhall beg leave to conſider the globe as divided into two ſpecies of matter: animated, or that which ſeems to have a life and exiſtence, and inanimated or inactive matter. The firſt claſs will employ the greateſt part of this ſhort eſſay. It may be neceſſary to mention a word or two concerning the laſt.—Inanimated matter, by which is chiefly underſtood the earth, cannot be ſuppoſed to be the ſame as it was before the creation of the ſun, in the ſtate of chaos. At leaſt that part of its ſuperficial ſurface which preſents itſelf to our conſideration, is found to be cover'd with the moſt inactive particles of once animated matter. The terreſtrial part of our globe has ſtrew'd over its ſurface the veſtiges of animal ſubſtances, and the moſt incorruptible particles of vegetables. It receives the corporeal matter of animals and vegetables, when they loſe that ſpirit of life by which they once were animated. It offers a ſhrine to receive the material remains of once moving and vegetating beings.

But how ſhall we account for that amazing bulk of waters, whoſe ſuperficies is thrice more extended than that of the earth? What can we invent to explain the cauſe of its ſalt and bitter taſte, and in which the ſea differs from all other waters? What occaſions the luminous appearance of the ſea at night? Theſe are queſtions which cannot be anſwered without aſſigning to it a more than fortuitous cauſe. May we not be allowed to ſuppoſe, that the omnipotent Creator form'd this vaſt volume of fluids for our ſpeculative views? It is certainly more conſiſtent with not only philoſophy but nature; why then ſhould it be derogatory to true philoſophy, to ſay that the ſea is the parent and origin of all animated, and the director of inanimated matter? Let the curious ſpeculator obſerve the myriads of inſects which retreat from every beating wave, to fix themſelves and live upon the earth. Let him trace the progreſs of the ſemi-formed glow-worm juſt riſing from the ocean, and crawling from its ſhores with the firſt principle, the electric fire, ſtill acting on its conſtituent matter. Semi-marine in its nature, it ſtill ſhines with that aſtoniſhing luſtre, which is one chief privilege of its original parent.

Enriched as we find the water of the ocean with the two firſt principles of nature, ſhall we not ſuppoſe it created by the Divinity for other uſes than the navigation of our ſhips, the boundaries of kingdoms, and extenſion of our commerce? Theſe laſt views may ſatisfy the monarch, the noble, or the merchant, but they cannot the philoſopher. Having aſſured himſelf of the exiſtence of that mucilaginous principle which he finds, on enquiry, to be contained in every animated part of nature, he next attempts to purſue the electric fluid, as the cauſe which forms this univerſal matter, in the hand of the Almighty. In the waters of the ocean he finds them both, as he is equally aſſured of their improbable exiſtence in mere earthy matter. Let it not be objected, however, that we excite the electric fluid more by inanimated ſubſtances, than animated living ones, becauſe reſin, amber, pitch, wax, gums, &c. are more electric. Before, I ſay, that we ſuffer ourſelves to be deceived by ſuch arguments, we ought to conſider them as manifeſt parts of either vegetable or animal matter, which ſtill contain great portions of their primitive mucilage, and the electric fire.

If the prejudiced ſcholar, who has enriched his mind with no other knowledge than what the ſchools have taught him, ſhould object, or refuſe to be convinced, I ſhall endeavor to ſhew how much he would have been deceived, if obſervation and experience had not rectified the many errors of the ancients. Let him look into his Lucretius, particularly the fourth and fifth books, and tell me how he can reconcile to obſervation, that the ſun and other fires refreſh themſelves with the waters of the earth.

- - - - *Cum Sol & vapor omnis*
Omnibus epotis humoribus exſuperarunt.

Or that the ſun and moon are no larger than what they appear to us.

Nec nimio ſolis major rota, nec minor ardor, &c.
- - - - - - - - - - - - - -
Lunaque . . . . nihilo fertur majore figurâ.

That night only comes upon us, becauſe the ſun has exhauſted the fires of the day.

- - - - *Efflavit languidas ignes.*

Or becauſe it conceals itſelf under the earth.

- - *Quia ſub terras curſum convertere cogit.*

That the ſtars fall from heaven in a great wind.

Sæpe enim ſtellas vento impendente videbis præcipites cælo labi.

For whoever, ſays M. de Voltaire, ſhould think he knew nature from reading Lucretius or Virgil, would find he had furniſhed his head with as many errors as are to be found in the ſecret cabinet of old Mother Bunch, or the ſublime treaſures of our almanack makers. From whence comes it then that theſe poems are ſo much eſteemed? Why are they ſo eagerly read? Becauſe certain claſical ſcholars, who have ſpent their whole life in learning latin, have found in them elegant deſcriptions, good moral, and admirable pictures of human life.—Good poetry pleads for all errors: and the mind born away by the beauty of expreſſion and ſtile, does not give one thought about the truth.

Wherever we turn our eyes, or ſuffer ourſelves to be led on by an eager curioſity to purſue the deſigns of nature, we find ample recompence for our enquiries. But it is not a ſufficient object to purſue the works of nature out of mere curioſity, it is neceſſary, if we would inſtruct ourſelves, to attempt the diſcovery of that power by which the various beings in the terreſtrial world, either ſurpaſs or are inferior to each other in their form, ſtructure and perceptions. The moſt inattentive and ſuperficial conſideration of this ſubject muſt, however, aſſure us of one great truth, That there are different gradations of excellent workmanſhip from the firſt dawning of the animating powers in the zoophyte, to the utmoſt perfection of human exiſtence in man. But the moſt eſſential object of our purſuits ought to be, to diſcover that labyrinth by which nature paſſes from the moſt inconſiderable to the moſt difficult taſk of organization. How ſhall we accompliſh ſuch taſk? The anſwer is evident; If you would learn how nature carries on her works, you muſt obſerve her in her different operations. Not that we are to flatter ourſelves, by the ſimple inſpection, we ſhall gain the heights of ſuch ſublime knowledge, time alone muſt accompliſh that object; but we ſhall, however, be ſo ſufficiently recompenced by the diſcoveries we do make, as not to doubt of their certainty. I explain myſelf: That is to ſay, if taken from juſt obſervations and void of empty hypotheſes. We ſhould firſt inſtruct ourſelves in the general principles of nature, endeavor to diſcover their dependence and action on each other; we ſhould endeavor, likewiſe, to eſtimate the true effects produced by ſuch actions, and aſſure ourſelves if the reſult of them, does correſpond with her laws. It appears to me the only proper method of inveſtigating ſuch of the works of nature as yet remain hidden from us, with the greateſt degree of human certainty.

We ſhall firſt endeavor to diſcover what nature appears to be, when conſider'd in her general principles. It is a queſtion impoſſible to determine, in the primitive ſtate of our terreſtrial globe, whether the matter of which it was then compoſed, did or did not contain the ſame degree of ſpiritueſſence in every part. If it did, we may then ſuppoſe that the matter was of the ſame kind, poſſeſſing the ſame degree of that general ſpirit with which the omnipotent Creator firſt animated and appropriated it. Such ſuppoſition is by no means repugnant to rational conjecture. For we may conſtantly obſerve the natural courſe, in which the moſt animated parts of bodies looſe that manifeſt portion of life with which they are animated, by the very circumſtance which contributes to their exiſtence, They divide into various natural ſubſtances, leſs perfect in themſelves than the whole which they produced. To elucidate this matter, it will be neceſſary to inform the reader, that certain parts of all animals, which poſſeſs the leaſt portion of that univerſal principle which we call *Mucus*, fall inevitably into a ſtate of imperfection and inactivity, and become inanimated parts of matter. For example, the bones of all animals (after the diſunion of the animating power which gives them life has fled from the corporeal ſubſtance,) notwithſtanding they ſtill adhere, for a ſhort time, by virtue of that animal gluten or mucus, which unites the calcareous parts, yet ſoon fall into a ſtate of inanimate duſt, and become a perfect paſſive principle of nature. From ſuch ſuppoſition we may be able to confirm a truth of which mention has ſcarcely been made. That the whole terraqueous globe, that is to ſay, its external ſurface, did once compoſe certain conſtituent parts of animated beings. Every ſtone which covers the earth has been formed by the workings of the ſea on the ſhells or parts of ſome once animated being. The frequent opportunities I have had of confirming this idea by real obſervation, on different parts of the ſea ſhore, leaves me no longer in doubt as to the truth of it: but as it is not juſt I ſhould expect the ſame credulity from the world, I ſhall beg leave to offer my obſervations in the courſe of the following eſſay.

We would adviſe the curious ſpeculator to purſue this object by conſidering nature under two points of view: firſt to obſerve her in her animated ſtate, and then to conſider her again as inanimated, or as the reſidue of thoſe parts of once animated bodies, which being deprived of their original ſpiritueſſence or animating power, do become void of exiſtence, motion or ſenſibility.—The external ſurface of our terraqueous globe is evidently ſpread over, in many parts, by theſe remains of animated nature; particularly in the neighbourhood of populous countries. In thoſe which are not yet diſcover'd by human induſtry, or where either man or animals have not yet eſtabliſhed an habitation, in ſuch places the ſuperficial earth has been cover'd over by the remains of animated Beings of a different genus. For there the inanimate parts of marine Beings ſpread themſelves over the ſurface of the earth, and indicate by the various and perfect remains of ſome of them, that they were once animated and exiſted.

But here comes the objection, which is thought the moſt material argument againſt this ſyſtem. If there are the remains of theſe marine bodies, which are ſo conſtantly to be found in the centre or near the ſurface of our higheſt mountains, how can we reconcile to our ideas, that Beings whoſe lives are paſſed within the waters of the ſea, can be tranſported ſo far from this element?

The beſt and moſt natural anſwer, is, that the diminution or retreat of the waters of the ſea, which once cover'd the whole earth, and which perhaps have waſh'd theſe very mountains for numbers of ages, did, when they cover'd their ſurface, animate thoſe marine Beings, whoſe inanimate remains are now become a portion of the general inactive parts of nature. A diminution which will perhaps continue 'till Iſlands join to continents, forming at laſt a prodigious maſs of inanimated earth, which at the diſtance we are from the ſun, muſt long remain in a ſtate of paſſive indolence.

This matter, which remains as inanimate and inactive in our globe, would, however, (if it was within the ſphere of the planet mercury,) be ſtill poſſibly poſſeſſed of a greater degree of activity; as the vaſt influence of the ſun upon its matter, might then probably fertilize thoſe powers which are not capable of ſhewing themſelves at ſo great a diſtance from it.

The inanimate parts of nature may more evidently be diſtinguiſh'd by thoſe ſubſtances which do not either poſſeſs the loco-motive powers in themſelves, or increaſe by the action of their internal agents. We cannot prove this part of nature to be without ſeveral properties which govern the animated world. They have their internal agent, and the property of extenſion. All kinds of metals, particularly iron and braſs or copper, which we ſhould call inanimate, are found to have this internal agent, by which they are capable of extenſion, as we prove by the pyrometer. Even metals have, perhaps, a greater analogy with animals than has been commonly imagined. I have ſeen various animal ſubſtances changed into metals, particularly the ſhells of the nautilus and corneamon. I do not pretend to affirm that the chymical analyſis is the ſame, becauſe I have not yet tried the experiment; but to all appearance they do not ſeem to differ.

We may be almoſt aſſured, that wherever we find a ſimilar organization in bodies, there is an internal agent which directs, and powers peculiar to them alone, by which they increaſe. This induced me to think that the different ſpecies of ſtones and pebbles were animated parts of nature. I obſerved a wonderful and ſimilar ſtructure in each of them. They differed indeed as to their bulk and ſize, but then they had each of them the ſame appearance of rotundity.

It was not in my firſt purſuits into natural hiſtory, that I diſcover'd the cauſe of this ſeemingly organization. But by ſtrict obſervation, I aſſured myſelf that every pebble which is ſtrew'd over the ſurface of the earth, was firſt projected within the ocean, and had received its form and rotundity from the conſtant agitation, and beating of the waves. I mean to ſay, at leaſt, that I never found one circumſtance to contradict this ſuppoſition, or to make me think different.

Upon the ſhores of Dieppe, in France; Biddeford and Margam, in the Briſtol Channel; Montpellier and Cette, in the Gulph of Lyons; or in the Bay of Roſes, in Catalonia; I had conſtantly obſerved ſome of the ſtones which had not yet become completely round. I perceived ſome of them to have the perfect form of the oyſter-ſhell, which was juſt beginning to indurate into ſtone. Others I found to be the whole oyſter incruſtated with an earthy ſubſtance. At Brighthelmſtone a trifling circumſtance ſerved to convince me of the continual workings of the ſea, being the occaſion of that globular form which we find in moſt pebbles. I obſerved that pieces of brick and tiles, which had been thrown upon the ſtrand, ſoon became round, and received the ſame form as the pebbles.

Pieces of chalk, which had been broken from the clifts, had ſoon received the pebble form, by the conſtant agitations of the waves. I was therefore no longer in doubt as to the ſimilarity of the organization which appears in the various ſtones, ſcatter'd over the earth, being moulded by ſuch agitations. I conſider'd them, therefore, as poſſeſſing neither the internal agent, or any principle of organization within them, but as mere inactive parts of nature, and inanimated matter.

The ſame circumſtance ſeem'd to confim M. de Mallet's ſyſtem on the formation of mountains. Indeed it is more than probable that the actions of the various currents, have collected together ſuch parts of inanimated matter as have ceaſed to exiſt, and added them to the original centers of the primitive chaos. By ſuch accumulations our continents have extended themſelves, and our iſlands lifted their heads above the ſurface of the waves.

The common objection, that the ſea ravages in one place what ſhe abandons in another, is a circumſtance too unphiloſophical to need a refutation. We may obſerve, indeed, that parts of continents are and have been overwhelm'd and cover'd by the waters of the ocean. Certain examples of this kind may be found in our own country. But ſurely theſe circumſtances are not ſufficient to deſtroy a ſyſtem which is founded in nature. Have we ever read or known of any inundations from the ſea that have ravaged the tops of our ſtupenduous mountains? I do not ſay but ſuch might have been the caſe, in the earlier periods of the globe, when perhaps the tops of thoſe enormous maſſes of earth, which are now cover'd with eternal ſnows, were beſpangled with a flowery carpet, and gave food to a world of Beings. That is, when their atmoſphere, which is now lifeleſs and uninhabited, were the regions of animated nature: when birds could endure the air which ſurrounds them, and animals live and move upon their ſurface. It is too plain that they are at preſent deſerted, becauſe the ſea, which once waſhed their ſurface, has now retreated ſo far from them. Becauſe, alſo, that we find the igneous pabulum of all nature, which gives life to every Being, or at leaſt prolongs it, does not reach above half up to their tops. Above which atmoſphere all is lifeleſs, cold, and inanimate.

As the ſea, therefore, has retreated from their ſummits, and as the vapors ſcarce ever riſe but to ſuch a certain diſtance from the level of its waters, ſo has the atmoſphere, which has retreated with it, left the tops of theſe enormous maſſes of earth, rude, cold, and uncover'd. The elementary principle which fecundates this atmoſphere of vapors in which we breathe, is no longer to be found upon their ſurfaces. Deſerted as they are by the ſource of vital exiſtence, no wonder that they become a region of eternal ſnow.

If we may be allowed to conjecture, it ſhould ſeem as if all theſe animating properties were derived from the evaporation of the waters of the ſea into the air, joined to the exhalation of certain vapors from the earth, which by mingling in the atmoſphere, form that heterogeneous maſs, of which this element is known to be compoſed.

Even the air, like the ſea, is enriched by the lucid matter to a certain diſtance from the ſurface of our globe, but on the tops of ſome of our higheſt mountains the atmoſphere is ſo pure and unmixed, that no animals can live within it, or ſupport its action. Deprived of theſe animating vapors which float throughout the region of our air, it is inſupportably cold, incapable of invigorating animal bodies, or nouriſhing vegetable ones.

Every obſerver may eaſily diſtinguiſh the apparent difference of the atmoſphere, when he ſees the tops of all high mountains cover'd with eternal ſnows, which never melt. Their ſummits, like the northern ſeas, are too remote from the animating principle of all nature, to receive their ſhares of its influence. For although they may be ſaid to be more expoſed to the immediate action of the beams of the ſun, than the vallies, and in conſequence more liable to be fertilized by its rays, yet daily experience convinces us, that this inanimate ſtate of that part of the earth, which is beyond ſuch a diſtance from the level of the ſea, is by no means to be accounted for by ſuch cauſes. Why are the tops of the Alps, the Pyrenees, the Bohemian Mountains, thoſe of Switzerland, the Lyonois, and the Auvergnian Hills, cover'd with ſnow, when the reſt of nature is crown'd with garlands of various flowers? It is not the clouds which intercept the rays of the ſun from darting on their ſummits with its greateſt vigour, that occaſion an eternal winter; for in the fine climates of Italy and

Spain, the horizon is unclouded through the greateſt part of the year, and a ſerene blue ſky often rules for many months together.

The bounds of the preſent ſhort treatiſe will not allow me to dwell any longer on the inanimate parts, I ſhall therefore proceed to the inveſtigation of the animated parts of nature.

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GENERAL IDEA

OF THE

SENSITIVE FACULTIES

IN

ANIMATED BEINGS.

EVERY Being ſeems to be endowed with a certain portion of life and exiſtence, with a degree of perception relative to the ſphere in which nature has determined it to move. To ſome ſhe has dealt out her favors with a more bountiful hand, to others ſhe has but ſparingly ſcatter'd them. In man we define this exiſtence and perception, by the general name of ſoul: when we ſpeak of brutes we call them inſtinct. That exalted degree of animality which we call ſoul, is the moſt aſtoniſhing phænomenon of human nature; a term frequently defined within the ſchools, but perhaps the leaſt underſtood.— Various have been the opinions of both the ancient and modern philoſophers, relative to her nature and ſeat. Some have placed the laſt in the pineal gland, others in the cortical ſubſtance of the brain, in the corpus calloſum, the ſeptum lucidum, &c. The ancients have given us in their works, ſome hints concerning the immortal and ſenſitive ſoul, but then they have only made ſome few enquiries into each of them, without aſcertaining the nature of either. This diviſion of the ſoul has, however, been adopted by more modern authors, who have confined the immortal ſoul to the head, and the ſenſitive or animal to the præcordial region. Van Helmont has more boldly endeavoured to explain the nature of that ſoul, which he calls archeus, or the ſervant of the ſpiritual, being placed within the cardia. Dolæus calls it the centinal or guard of the immortal one, and gives it nearly the ſame place, M. de Buffon, who copies the moderns, as Plato and Ariſtotle copied Hippocrates, eſtabliſhes a new kind of general ſenſe or ſentiment in this region, which he calls by the name of interior region.

The Stoics compared the ſoul to a polypus, extending out its branches to purſue and ſearch after the ſenſations. The learned and indefatigable Malphigius placed it in the point of the medulla-oblongata, the central point from whence he obſerved the firſt rudiments of the embrio to ſpring and take its origin, forming, by its extenſion, the head and ſpine of the young chicken. This ſentiment of our learned author, recceives a ſtrong confirmation of its probability from the experiment made by Galen on the brain, (in his ſeventh book) where the wounding of the latter ventricule ſeems particularly to allude to that point of the medulla-oblongata, in which Malphigius places the firſt rudiments of the embrio. The ancients believed alſo in certain faculties, or a general force, which modified and gave a natural ſenſibility to different parts of the human body, animating it in the whole, throwing itſelf ſometimes from the head to the feet, and again from the feet to the head. This opinion correſponds with the univerſal principle of Hippocrates, which he call'd the *enormon*, or *principium magnum*. By the means of this grand principle, or the ſenſitive faculty, ſhed throughout

out the whole nervous ſyſtem, he imagined that all was animated in the human body, expreſſing himſelf by theſe words, *animantur, animalium omnes partes*: and Lucretius, who was of the ſect of the Epicureans, ſays, *ſenſus in eſt nervis, viſceribus, venis, quœcumque videmus*. But theſe noble and maſterly dogmas of the ancient ſchools, were oppoſed by Galen and his diſciples. They invented animal ſpirits, which by their action in every part of the body, was to excite the active principle mentioned by Hippocrates. According to the Galeniſts, there were different kinds of ſpirits for the different functions: thus the vital functions had ſpirits which were placed within the heart, the natural in the liver, and the animal in the brain. Different denominations were given them by thoſe who attempted to explain their nature. For this reaſon our learned Willis calls them ſometimes by the name of lucid,* at other times he names them the ætherial ſpirits. Mayow and Beare call them nitro-aerious: Sylvius compares them to ſpirits of wine: others call them acid, ſpirituoſo ſulphureous. Others have compared them to the electric matter. Indeed ſcarce any philoſophical opinion is more ancient than that which has ſuppoſed the exiſtence of this general matter. This opinion has certainly gained ground in ſpite of prejudice. All our modern improvements have confirm'd its exiſtence, in a much more ſatisfactory manner than thoſe of the ancients: ſo that at preſent our enquiries ſhould be, rather to attempt to prove and diſcover the manner in which it acts, and determine the different changes it may undergo from various cauſes, than to ſearch for any new proofs to demonſtrate its exiſtence, of which we have already ſufficient. Whatever important diſcoveries may yet be made in ſuch purſuits, they can, at beſt, only ſerve to convince us more ſtrongly, that the ideas which the ancients form'd of the exiſtence, and the general properties of this matter, were in cloſe affinity with our own obſervations.

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* Itaque *ſpiritus animales* juxta analogiam hanc (quæ, ſc: eorum cum aliis rebus præcipua & fere unica occurrit) dicamus eſſe corpuſcula ſubtiliſſima, ſummeque agilia, e ſanguine accenſo in cerebrum & appendicem ejus inſtillata quæpartim ex ſua natura, quatenus *lucida* ſunt & *aerea*, &c. &c.

WILLIS, *De Anima Brutorum*. C. 4. P. 74.

From theſe ideas of the ancients, confirm'd by the experiments of ſome moderns, ſeveral

French authors, among whom we may reckon Meſſrs. La Caze, de Bordeu, Vennel, Fouquet, &c. ſeem to think, that the general effects, hitherto attributed to animal ſpirits, in the direction of the animal œconomy, might with much greater propriety be applied to the electric principle. It is certain, that its univerſality, and the clearneſs of its exiſtence, ſeems preferable to all thoſe vague ſuppoſitions; which the ſectators for animal ſpirits have been conſtrained to invent in ſupport of their ſyſtem. Innumerable chimeras have been brought to eſtabliſh the nature and properties of the animal ſpirits.

Theſe gentlemen mention in their favor, that the idea of the action of the nerves, produced by the conſtant effects of an etherial fluid, (which they think analogous to an electric one) was what Sir Iſaac Newton ſpecified in the twenty-fourth of his queſtions. Although Sir Iſaac does not ſeem to ſpeak ſo poſitively on that affair, as if it was inconteſtable, it may be preſumed, notwithſtanding, that he would not have advanced what he has done, if his ſentiments had not been founded on a manifeſt analogy, or ſome particular experiment. Has the opinion of animal ſpirits increaſed ſince his time? We are certain that the effects and properties of the electric fluid have been and are ſtill improving. Beſides, the ſoft ſubſtance of the brain, and its inert ſtate, muſt render it improper for that ſpring and elaſticity, which the ſectators for animal ſpirits think ſo eſſential to the mechaniſm on which our ſenſations and perceptions depend.

The action of the brain has been ſupported by ſeveral perſons, againſt them who (in return to the objections made on its activity) have aſſerted, that it was aided by the ſpring which its membranes, the dura and pia mater, might furniſh. The celebrated La Caze, has anſwered, in a very ſatisfactory manner, to this ſuppoſition, and endeavoured to prove that theſe membranes were utterly improper to produce ſuch effect. Even, ſays he, could we ſuppoſe the brain, aided by its membranes, of the dura and pia mater, to poſſeſs that radical and primitive degree of ſenſibility, ſo as to endow it with a ſpring and activity peculiar to itſelf, it muſt follow that the traces on which are formed the reminiſcence of our ſenſations and ideas, could not in any manner be perpetuated. Certainly the active principle of the brain muſt be evidently ſuperior to thoſe impreſſions which are made by the ſenſations on the ſuppoſed fibres of this organ. It muſt follow from hence, that if a ſenſation ſhould ſtimulate one of the fibres of the brain, the active principle peculiar to this organ, muſt either occaſion a confuſion in our ideas, by its reaction to that impulſe occaſioned by the external agent on the nerves, or obliterate the ſlender traces of the ſenſations before they were well formed.

Dr. Monro, in his treatiſe on the human nerves, ſeems to have ſtated the different ſentiments of authors on their nature, in a very clear and ſatisfactory manner. Notwithſtanding all which, and our unwearied purſuits, in the inveſtigation of theſe profound cauſes, have been carried as far as human induſtry has been capable of reaching, it is mortifying to find we are not at preſent more certain of the nature and uſes of the nerves. The lateſt ſyſtem of the nervous fluid has loſt its ſtrongeſt ſupport, by a celebrated anatomiſt partly denying the circulation of this fluid by his experiment on the compreſſion of the diaphragmatic nerves; and inſtances have been known where the axillary nerves have been found preſſed flat by a tumor, without obliterating the neceſſary and uſual functions.

If there are certain beings which give manifeſt ſigns of ſentiment and movement after the head has been ſever'd from the body, ſuch as flies, frogs, tortoiſes, ſnakes, &c. If the heart taken out of the body of the animal continues to move for ſome time: or a part pricked or wounded to contract itſelf: If the muſcle, after the death of the animal, is irritable, the nerves enter into convulſion; children have been born acephali, and lived a ſhort time: Where ſhall we place the ſeat of the ſoul?

But as we are, and ſhall, perhaps, for ever remain ignorant of the nature of the ſoul, or by what divine principle our nerves are animated, a diſcovery which ſeems ſuperior to the reaſoning faculties of man. Let us then conſider the world as a beautiful and vaſt compoſition of the progreſſive works of nature's hand, in which we find nothing to exiſt without its uſe, or deſtined to ſome purpoſe, mark'd out by the creator. Within this beautiful ſcene are many orders of beings, variouſly organized, ſubject to different impulſes, and moving by various ſprings of Life, ſuch as inſects, birds, fiſhes, animals, &c. Among the latter claſs, and at their head, we rank man, to whom it ſeems as if nature had open'd her richeſt treaſures, to whom ſhe has given a ſuperior degree of perception, and ornamented by an exalted ſentiment. Led by her hand under the gentle influence of his ſenſes, he taſtes of her richeſt bounties, and ſeems to enjoy peculiar advantages over the other part of the creation. On the contrary, were we to ſuppoſe him deprived of his ſenſes, thoſe vigilant guardians of his ſafety, he would be reduced below the claſs of animals in general, and at every moment muſt ſuffer from the impulſes he would receive from the inanimate part of nature. In ſhort, bearing the form and ſymmetry of man, would ſcarce enjoy an exiſtence superior to the vegitating plant, or to the nature of the Zoophytes.

It may be aſked, what are then the conſtituting principles which form this ſuperior degree of excellence ? I anſwer, the human body has been thought to conſiſt of both active and paſſive principles : as the animal parts of man, or what partakes of that nature, or are capable of ſenſations, ſeem to be the nerves, or nervous ſubſtance, whilſt every other part ſeems to be inſenſible and inactive, relative to the nerve which is active. The active parts, by their nature, are the channels which convey the ſenſibility to every part of the human body ; it is they which animate it. By the influence of the nerves we perceive or feel the general impulſe of all animated nature.

The paſſive principle is diſtinguiſhed by the general name of mucual web, or what Mr. Haller calls *tela-celluloſa*, and the French authors *tiſſue-cellulaire*. This mcual web is an organ, or rather a falſe organ, known by phyſicians under the uſual name of cellulary membrane. Our phyſioligiſts have too much neglected their enquiries into its nature and ſtructure ; and anatomiſts ſeem only to have remark'd that certain portion of this organ, which is to be found ſurrounding and connected between every fibre of the muſcles. The cellulary-membrane is not only of the greateſt extent, but alſo of the utmoſt conſequence in the human ſtructure, for it not only enfolds but enchains and penetrates it in every part: and the different denſities of its ſubſtance does not modify the ſenſibility alone, but contributes, by its reaction, to the movements of the nervous fibre, in the different organs; for we are to obſerve, it is infinitely more denſe in the organs which aid the different motions of the body, than in thoſe which are deſtined to receive the ſenſations. Remark again, that it is not the conſiſtence or figure of the mucus, which determines the proto-type imprinted by the creator on the animal molecules, but infinitely more ſo the different ſenſibility of thoſe nerves, which conſtitute the eſſence or life of each reſpective organ. For the mucus only has influence on the ſenſibility of different organs, either by a variety in its mixture, or by its different conſiſtence. In ſhort, the mucual web, by its exudation, ſeems to varniſh over every nervous fibril, it fills up every part which compoſes the ſurface of the human body, it gives the agreeable contour, and contributes to the plumpneſs; it helps the firmneſs, the elaſticity, and the poliſh of the ſkin.

Beſides, the cellulary membrane of the whole body, all the humours, fluids, nails, bones, &c. are paſſive as to their ſenſibility, and enjoy only the ſmalleſt portions of animal exiſtence. If we take a view of the human *embrio, we muſt obſerve that it is really and eſſentially but a nervous ſkeleton, incloſed and incruſtated in every fibril, by a mucual matter, and ſwimming in a maſs of †colliquamentum.

The ancients alſo diſtinguiſh'd the rudiments of man by the idea of a nervous ſkeleton, calling it the human tree inverted, at the root or beginning of which reſided the ſoul.‡

From what I have mentioned it ſeems neceſſary that we ſhould regard the human body,

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[*] See the works of Malphigius. De Ovo Incubato.

[†] Omnes profectò fatentur, fœtum, dum in utero eſt, copioſam aquam innatare (nos, in ovi hiſtoriâ, liquorum hunc, colliquamentum nominavimus.—Exercitatio: Hery: 57.

[‡] Le Camus Medicine pratique.

body, as poſſeſſing diverſe centers of different ſenſibilities, depending on their various ſtructures. And altho' we are to conſider the principal organs of life, as form'd by either the nerves or the nervous productions, becauſe it is they which ſeem to poſſeſs the moſt exalted degree of ſenſibility and exiſtence; yet if we compare certain parts of the human body, which are found to poſſeſs ſo eminent a degree of activity and ſenſibility, with the few nervous fibrils they receive, ſhall we not be induced to think they have a peculiar ſentiment natural to them alſo? For it does not ſeem probable that ſuch a few nervous fibrils ſhould contribute to ſo manifeſt an action. The experiments made by Mr. Haller, on the irritability of the different parts of the body, have been partly contradicted by a French author. This gentleman mentions his having repeated the experiments of Mr. Haller, but he found that the diaphragm, the dura-mater, the tendons, the aponeuroſis, the interior tunics of the ſtomach and inteſtines, were endowed with a great degree of ſenſibility: and altho' the muſcular parts were naturally more active, yet they were leſs ſenſible; as on the contrary thoſe parts which were endowed with great ſenſibility, poſſeſſed a leſs ſhare of action. And indeed it is very evident, that there are certain parts of the body which ſeem more fitted to ſentiment than to movement, as there are others more proper for motion than ſentiment. This ſeems no where more conſpicuous than in the ſtructure of the eye: the optic nerves poſſeſs a ſhare of ſenſibility ſuperior to any organ in the human frame, and the nerves which diſtribute themſelves on the eye-lids, tho' they do not ſeem to have a ſentiment ſuperior to the nerve of any other muſcle, yet poſſeſs an exalted ſhare of activity and motion. And as the generality of the membranes alſo have very few fibrils, if ſome are not totally deſtitute of nerves, how ſhall we account for the activity and ſenſibility of the dura-mater and perioſteum, if not from a ſentiment which ſeem peculiar to them? For both theſe membranes poſſeſs a degree of activity and ſenſibility which we ſhould not ſuſpect them to have, from the few nerves we find diſtributed to them; and theſe few nerves which they are known to receive, are leſs to be conſidered, as the inſtrument contributing to the action which belongs to theſe organs, than the cauſe which is to determine their action.—Anatomical enquiries have diſcovered to us, that every organ has leſs occaſion for the aid of nerves, to endow them with activity, in proportion as they approach or are ſimilar to the ſtructure of the dura-mater: excepting only the organs of the ſenſes. And the degree of ſenſibility belonging to ſome membranes is very evident from the tumults raiſed in the conſtitution by their inflammation and affection.

But if it be true that the muſcles have more action, and are leſs ſenſible than the membraneous parts, the aponeuroſis and tendons; and on the contrary theſe laſt are leſs active but more ſenſible; we muſt be under the neceſſity of dividing the body into two different claſſes.—The firſt claſs ſhould contain the extreme ſenſible parts, aponeuroſis, the tendons, and membranes: the ſecond ſhould be formed of the extreme active ones, ſuch as the muſcles and parts relating to them: notwithſtanding all which, we are ſtill to regard the nerves as the ſource of ſentiment, particularly ſo in the organs of the ſenſes. For it is evident that the animality, or the life itſelf, does only conſiſt in the ſenſibility of the different parts of our body, the true ſource of which is the aggregate of the nerves, tracing the labyrinth of each reſpective organ. It is this entelechia, this aggregate of our ſenſations, which forms the baſe and foundation of our perceptions: for if we examine the ſtate of thoſe organs, which are deſtined to the ſenſes of man, we ſhall find the nerve either to poſſeſs a peculiar ſenſibility in each, or to be differently modified in their ſtructure, by that paſſive principle which I have called the mucual-web.—Let us obſerve only, with what care and attention nature has cover'd over the organs of the ſenſes by this mucual principle; with what ſcrupulous exactitude ſhe has choſen it, ſo as not to curb their free and unconſtrained exerciſe. In ſome the nerve is almoſt bare and uncover'd, in others the thinneſt web of this paſſive principle protects them, and ſome are not only ſurrounded, but as it were, wrapt up within its folds.

Thus for example: in the ſtructure of the eye, the optic nerves, oppoſe to their agent only ſome ſlender threads, or diaphragms of a watry, thin and tranſparent mucus, to modify the natural impulſe of the rays of light. In the organ of hearing, the acouſtic or auditory nerves are protected by the different obliquities of the labyrinth and the paſſage by which the ſound enters. In the ſmell, the nerves are almoſt pulpuous, almoſt naked, but then they are modified by the different anfractuoſities of the cavity of the noſe, and by the mucilaginous humours of the mucual glands, which varniſh over the ſurface of the pituitary membrane. In the taſte, the nervous papillœ are invaginated in the ſpongy texture of the tongue. The extremity of the nerves which compoſe and conſtitute the touch, are cover'd over by the epidermis, and ſtill more protected by the mucual matter of the ſkin.

It is therefore reaſonable to ſuppoſe, and the late improvements in anatomy have in ſome meaſure confirm'd the idea, that all our ſenſitive faculties, every perception of external objects, depend on the *ſenſibility*, *perfection*, and *diſtribution* of the *nerves*. Whether, with the ancient philoſophers we ought to conſider the ſenſibility of the nerves, as emaning from the natural heat, or *that electric power, which they regarded as the agent, the author and cauſe of all natural productions, is what I cannot determine: I ſhall conſider them as poſſeſſing the property of conveying to the *ſenſorium-commune*, the impreſſions made on them by different external cauſes. And that they have not only a general ſentiment, but it ſeems as if each nerve poſſeſſed a ſenſibility peculiar to itſelf. For the nerves of the ſtomach differ eſſentially in their taſtes and affections from thoſe of the eye.

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* I cannot help thinking, but ſome time or other, we may be enabled to inveſtigate the true principles of the electric matter, and to aſcertain its af-

But even this ſentiment (which we are to regard as proper to the nerves) may be affected and diminiſhed by various circumſtances. For their ſenſibility may be deſtroyed, if too powerfully compreſſed by accidental foreign cauſes:

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finity with what is call'd the animal ſpirits, or the nervous fluid. We are aſſured from experience, that the electrical fluid does not affect every perſon in the ſame manner, and ſome are by no means ſuſceptible of it. It might be worth while to attempt to diſcover the true properties of narcotics, by electricity, and particularly opium, with the relation they bear to the electric fluid. We know already that the circulation of the blood receives an impetus from the electric effluviæ, whereas narcotics diminiſh it by relaxing the tone of the ſolids.

cauſes: their excellent perceptions diminiſhed if the balmy dew which moiſtens them ſhould be leſſened or impaired, or ſhould it be too abundantly or profuſely ſhed over them. Their tone will alſo be deſtroyed by either a ſevere tenſion, or a too great degree of laxity; and the nerves may ſuffer from the unequal and imperfect oſcillations of the paſſive principle, or the corpus reticulare.

From what I have juſt mentioned it will be eaſy to form the idea of thoſe cauſes which characterize the perfect criterion of their animality. The true indication is, firſt, that the nerves deſtined to the different motions of the body, ſhould be unconſtrained. Secondly, in thoſe where the ſentiment is more manifeſt, they ought to be moiſtened by the gentle dew, which keeps them ſupple, yielding and pliant, and above all, the general oſcillations of the nerves ſhould be preſerved by the due and uniform reaction of the paſſive principle.

Thus again the diſtribution of nerves to one part more than to others, may in ſome degree form the criterion of their various ſenſibilities; we may alſo ſuppoſe that it renders ſome organs more eſſential and more concerned in the phænomena of life than others. It is the ſenſibility, diſtribution, quality and modification of the olfactive, optic and auditory nerves, which render them ſo ſuperiorly proper to inſtruct us of the nature of the diſtant impulſes, without the abſolute contact of the touch to aſcertain them: for the actions of the nerves are determined by the mediate or immediate contact of bodies, relative either to the ſenſibility of the organs, or to the functions to which they are appropriated. In the touch this contact is more immediate than in the ſight, and ſome demand ſolid, fluid, and even rare bodies, as the ear and tongue, whilſt the eye requires only ſo gentle an impulſe as the rays of light. The ſenſibility of this organ manifeſtly proves its excellence over the groſs one of the touch, for notwithſtanding Deſcartes would ſubject this eſſential and ſublime ſenſe to the powers of feeling, and judging of the form of objects by the hand: altho' the blind man judges by his croſſed ſticks of what is to the right or left, yet the rays of light muſt affect him in ſo inſenſible a manner, that he cannot have the leaſt idea of thoſe impreſſions which luminous

minous bodies excite on particular nerves, as on the expanſion of the optic in the retina.

Beſides, thoſe properties which I have already mentioned as peculiar to the nerves, we are to conſider every organ of the human ſtructure as connected together. It is this connection that produces the ſympathy ſo remarkable between them.—Each organ is directed likewiſe by an affection peculiar to itſelf; the conſequence of either the ſenſibility of the nerves, of its ſtructure, or their modification. But notwithſtanding this ſympathy, this *conſenſus* is univerſally agreed to exiſt in the human body, yet authors are undetermined as to the means by which it is produced.—The general, and perhaps moſt probable opinion is, that the ſympathy between the various organs depend upon the nerves, ſince it is them which give the action and movement to the different parts. But as our celebrated *countryman obſerves, we cannot explain the diverſe phænomena of this ſympathy, by any union, or anaſtamoſis exiſting between the nerves, in their courſe, from their origin, the brain, to the different parts in which they terminate; becauſe there are ſeveral remarkable examples of a ſympathy exiſting between organs, which ſeem utterly deſtitute of any connection. This gentleman imagines all *conſenſus* therefore to depend on the brain and ſpinal marrow, from whence every nerve takes its ſource: for we muſt obſerve, ſays he, that all ſympathy ceaſes between different parts of the body, when their communication with the brain, the origin of the nerves, becomes intercepted.

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* Mr. Whytt.

To inveſtigate this matter, let us conſider the human body (as I mentioned before) to conſiſt in different centers, of various degrees of ſenſibility: thus for example; the hair, bones, nails, cartilages, and fluids, ſeem almoſt inactive and inſenſible; or, if I may be allow'd the expreſſion, they poſſeſs the ſmalleſt ſhare of animal exiſtence: the muſcles are more animated; the membranes, perioſteum, aponeuroſis, tendons, &c. are ſtill of more conſequence to life; and the nerves, when animated by their electric or etherial principle, the moſt refined and delicate parts of animal exiſtence. It is probable therefore, that the ſympathy between the different parts of our ſtructure, does not ſo much depend on the brain, the origin of the nerves, as it does on the various ſenſibilities of the different organs by which life is connected together and animated. And this will appear more evident, if we conſider that when any part of the body is excited by an offending agent, the effect produced on the conſtitution will greatly depend on the conſequence and the relation the part irritated bears to the general phænomena of life. Excite, for example, the bones or cartilages, by any kind of ſtimulus, and the animal will remain inſenſible to its effects; for in the trepan or ſawing of the bones in amputations, the patient does not ſeem to ſuffer any pain: I have ſeen violent fevers brought on by wounding the aponeurotic membrane with a ſharp inſtrument, and every phyſician knows the dangerous effects produced by inflammations in the membranes. Great part of the brain is in itſelf inſenſible. The nerves, notwithſtanding, are the ſource of all even to the moſt exquiſite ſentiment, and the leaſt irritation in the præcordial region, are generally attended with the moſt fatal conſequences. Although Dr. Whytt juſtly obſerves, we cannot trace theſe communications by the nerves; yet ought we to infer from thence, that they are not the true cauſes of ſympathy in the human body. Conſider the origin, the diſtribution, and the progreſs of the nerves, called great ſympatic, by which are executed the principal connections with every part of the body. Let us call to mind the diviſion I have juſt made of active and ſenſible parts, and then we may eaſily comprehend how neceſſary it is to our ſenſations, that one or other of theſe faculties ſhould have the pre-eminence in the ſame organ. What would have been the conſequence, had they both exerted an equal degree of exiſtence in the ſame part? Unequal diſtributions of the vital fluid, and a continued ſtate of ſpaſm and diſorder in the ſolids. For had the muſcles been as ſenſible as the tendons, or our membranes, the preſſure of the ambient air alone, or the leaſt attrition againſt ſolid bodies, muſt have thrown us into a continual ſtate of convulſion. Such an exceſs of ſenſibility in our ſtructure, tho' a more exalted degree of animal exiſtence could never be endured by beings endowed with ſo ſmall a ſhare of perception as our own: for could we ſuppoſe our bodies animated by that ſuperior eſſence, our exiſtence would perhaps be coeval with celeſtial beings, and the perceptive faculties of our minds coenobitick with theirs, to direct and govern ſuch refined and exalted ſentiment. But as human exiſtence was never intended, by the omnipotent creator, to aſcend to ſuch ſublimity, we can only reſpectfully adore what is ſo much above our nature to comprehend. To return to our ſubject:—

One objection to the ſentiment of Mr. Whytt, who ſuppoſes all ſympathy to ſpring from the brain and ſpinal marrow, is, that the natural ſenſibility of this organ does not render it of ſufficient conſequence alone, to afford us a proper *appuy* on which we are to found that ſympathy, which rules and governs the whole circle of animal exiſtence. For this ſympathy is one general cauſe of our ſenſations. How then can we attribute the origin of ſuch an active principle as our ſentiment to an organ ſo manifeſtly paſſive and inſenſible.—Beſides, if the origin of all ſympathy concenter'd in the brain and medulla-oblongata, does it not imply that theſe organs ſhould be the ſource of all movement equally: for it is certain that every part in the human body which is deſtitute of ſentiment, is deſtitute of movement alſo. But we find, that the brain is ſo far from being the origin of movement, that not only movement but ſentiment is found to exiſt in the embrio, previous to its formation. And I have the advantage of confirming my opinion by the ſanction of the immortal Harvey.* It may be objected, perhaps, that the brain is known to have a great degree of movement, which is diſcovered when part of the ſkull has been taken away by the trepan. To which it may be anſwered: the brain does certainly move, but then it appears evident, that its motion depends on that communicated to it by the diaphragm. This has been clearly proved to be the caſe, from the experiments made by the celebrated *M. De la Mure, of the univerſity of Montpellier, after thoſe given by Mr. Schligting.—It muſt therefore be obvious to every reader, how improper

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* Nempe (cum motum & ſenſum, ante natum cerebrum adeſſe liquidò cernamus) manifeſtum eſt, non omnem motum atque ſenſum à cerebro proficiſci: ſiquidem ex hiſtoria conſtitit, inprima ſtatim ſanguinis guttulâ in ovo, antequam quicquam corporis efformatur, ſenſum motúmque clarè eluceſcere.

† See his eſſay on the movements of the brain.

the brain alone muſt be to direct and govern the whole circle of the animal œconomy, was it not aided by the radiant beams of the ſpiritual eſſence of life placed in the præcordial region. For it is within this center that we are to obſerve the ſacred and eſſential principle which rules, governs, and conducts the aſtoniſhing ſprings of our exiſtence. Such was the opinion of our obſerving Hervey.† We cannot have the leaſt doubt relative to the truth of it, if we conſider how much the diaphragm becomes, by its ſtructure, ſuperior to every part of the body. For it participates, in a very eminent degree, of the two faculties of activity and ſenſibility united. It is the nature of its ſtructure which gives it the pre-eminence over the brain. Its circumference is muſcular, and deſtined to a continued and inceſſant movement, which is to perpetuate the chain of our exiſtence, and force on the ſprings of life. Within the middle of this diaphragm we are to obſerve the cardiform center, derived from the continuation of the muſcles into tendon or aponeuroſis,

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† Unde non tam cerebrum, quàm cor ipſum, eſſe primùm principium judicemus.——

Exertcitatio: Herv. 56.

neuroſis, forming what Meſſrs. la Caze and de Bordeu have call'd *centre phrenique*:—In ſhort, from the blended ſtructure of muſcle, aponeuroſis, and nerve, the diaphragm becomes an organ of perpetual activity. But that the reader may have nothing to deſire relative to an ecclairciſſement of this important matter, we ſhall preſent him with one of the moſt remarkable phænomena of human nature.—We ſhall bring before his eyes a ſcene in which he will obſerve a manifeſt motion in the præcordial region, when the rudiments of the brain, imperfect and unformed, are no more than three watery globes of limpid mucus, where the ſlender traces of the yet undeſcribed heart, beat and pulſate, with an aſtoniſhing vivacity. We ſhall make him obſerve the purple ſtreams of blood, which run on in their courſe to meet this organ; and ſurprizing as it may ſeem to ſome perſons, we find this humor to receive its proper fermentation within the yolk of the egg, lòng before the leaſt veſtige of the liver appears, or the heart is compleated in its formation.*—I opened the egg of a ſmall bird, when far advanced in the labyrinth of generation, whoſe appearance was nearly as repreſented in the ſmall figure annexed. The form of the animal was only imperfectly traced out: the brain conſiſted in three ſmall globules of limpid gelly, and the whole body had the appearance of a white tranſparent mucus, as yet void of any apparent ſenſibility, except in that center where the rudiments of the præcordial region began to be diſplayed: and here I was ſurprized to find with what activity the pulſations, and the ſyſtole and diaſtole of this center continued, tho' expoſed for ſome time to the impreſſions of the circumabient air. Shall we then ſcruple to place the ſource of animal motion and exiſtence in the præcordial region, in the center from which we diſcern ſuch manifeſt life and activity: for altho' the cicatricula may poſſeſs a ſmall degree of ſenſibility, yet its motive powers are ſo very occult, as to be ſcarce perceptible. In ſome eggs which I had kept over a ſpirit of wine lamp for thirty-ſix, and ſometimes forty-eight hours, this cicatricula appeared to me nearly as I have repreſented it in the ſecond figure, which I have ſometimes irritated with a pin, or pointed inſtrument, without perceiving any degree of contraction

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* Veſiculas in ovo moveri, cor micare, ſanguinémque jam perfectè coctum adeſſe, antequam hepatis vola aut veſtigium conſpiciatur.——

Exercitatio. Herv. 18.

Plate the 1. to front Page 30.

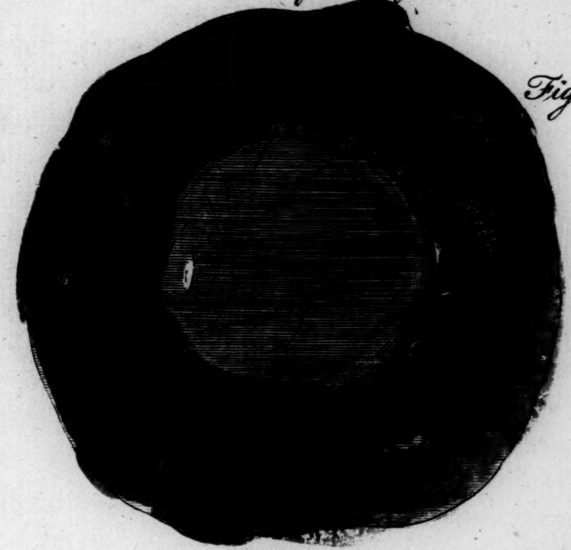

Fig 1.

Fig 2.

or dilatation.—But the celebrated Harvey has ſaid, " *Statim a gallinæ incubatione cicatricula* " *primo omnium dilatatur, augetur, & colliquamentum conſtituit.* And Malphigius has remarked alſo, " *Enim familiare ipſi Naturæ* " *ſæpiùs obſervavi, in zonis motum adeſſe ita ut* " *ſuo acceſſu, & receſſu areæ & ſinus excitarentur & tollerentur.*" But we are to obſerve, what Malphigius mentions, is in a more advanced ſtate of the embrio, than I have repreſented it in fig. 2. tho' previous to the appearance of the *punctum rubrum vel pulſans.*

We cannot help conſidering this ſenſible and active motion of the diaphragm, as evidently eſſential to our exiſtence, and perhaps the origin of all our ſenſations. The conſequence of the phrenic centers to life are evident, for it is they which direct the activity and ſenſibility of the various parts, and diſtribute the different humors to their proper receſſes. Hear Mr. Hervey's opinion on the nature of the heart. " *Cor itaque eſt prima animæ ſedes, ſons vitæ, & focus perennis,* " *calor genitalis, ipſúmque adeò calidum innatum;* " *primùm partium ſuarum omnium inſtrumentalium efficiens, animámque pro fine ſortitum,* " *quæ illis omnilus, ceu inſtrumentis utatur.*"—

After ſuch manifeſt proofs of the ſenſibility and activity of the præcordial region, and the opinion of ſo many celebrated anatomiſts, confirm'd by our obſervations of ſuch evident life exiſting within it; I ſay, after ſuch remarks, can we at leaſt refuſe to acknowledge, with the ancients, and men of ſuch unequall'd merit as Ariſtotle, Aldrovandus, Harvey, Malphigius, &c. that there are different foci of exiſtence within the human ſtructure: or that the diviſion of the ſoul, imagined and ſupported by ancient authors, was vain and ſuppoſititious only? For it is certain, that various phænomena juſtify their ideas on this matter, if we conſider only how much every ſentiment of hilarity and joy, or unexpected trials of grief, miſery and woe, are painted on the phrenic centers. Can we account in any other manner why we are ſo much affected at ſcenes of cruelty and torture? This is what every one may have experienced who, to indulge a vain curioſity, has been preſent at the execution of ſuffering criminals. Has he not found the heart become unequal in its pulſations, the diaphragm move as if conſtrained, and ſighs of compaſſion ſpontaneouſly eſcape, while the tear of pity and of ſorrow ſtood trembling in his eyes. Have not women, whoſe delicacy of ſtructure and vaſt ſenſibility of nerves, render'd ſubject to hyſtericks; become pale, ſicken'd, and fell down deprived of both ſentiment and movement, and ſunk into an inert ſtate from which they have been with difficulty recovered. On the contrary, from ſcenes of pleaſure and delight, the diaphragm moves without conſtraint, the heart pulſates with equal and free vibrations, and ſeems to endeavour to extend itſelf beyond the center of its exiſtence. In fact, we find within this region the pure ſpring of every pleaſure, and the unwelcome harbinger of every painful ſenſation. The pleaſures we receive from theatrical repreſentations, ſeem no more than different modifications of theſe two extremes, excited within our breaſt by the intereſt or prejudice we take for the ſufferer or the hero: and in proportion as they affect us with an appearance of reality, ſo does this ſentiment approach by its influence to the nature of our ſenſations, the ſame as the parent feels for his darling child, or the tender mother for the gentle offspring of her boſom.

It will undoubtedly be objected, that I want to eſtabliſh the two-fold nature of the ſoul, mentioned by the ancients. Indeed it is a circumſtance which is unavoidable, unleſs we attribute to the animal ſoul of man thoſe ſublime perfections which ſhould diſtinguiſh the immortal one, correſponding with that faculty which in animals is call'd their inſtinct. To correct ourſelves of ſuch error, and to hinder us from falling under their cenſure who might tax us with favouring materialiſm, it will be more prudent to follow that opinion, in which the functions of man were diſtinguiſh'd into two different claſſes. The firſt are the functions of the reaſonable ſoul, which is conſcious of itſelf and its works, free in its acts, enlightned and moving by its own general influence, comparing, reaſoning and conſtituting in every degree the moral part of man. The ſecond order of functions are thoſe of the animal œconomy, whoſe circle is properly to be conſidered as whatever conſtitutes the phyſical eſſence of man. Theſe laſt are moved by that directive and governing principle eſtabliſhed by the author of the univerſe, which philoſophers have called nature.

The mechanical application of external objects to the organs of our ſenſes, produce our different ſenſations, as the organs appropriated to each diſtinct ſenſe find themſelves affected. Theſe impreſſions are continued to the ſenſorium commune, where the ſenſitive ſoul keeps all the nerves under her ſubjection. The ſenſitive ſoul having received the ſhock, conveys the impreſſion to the rational and immortal one, which affected in her turn, conceives an idea correſponding to a certain ſenſation.

May I not ſuppoſe the nerves to have a continual ſpring, with a certain and perpetual tenſion, by the means of which the organs of the ſenſes are inceſſantly diſpoſed to obey the impreſſions made on them by external objects. So that a nerve excited, or ſhook by an impreſſion, increaſes in its tone, and the ſpring is augmented by the vibrations it undergoes. For is it probable that the impulſe of a foreign agent ſhould produce a determined ſenſation, if the nerves did not poſſeſs that degree of radical and primitive ſenſibility, which we ſuppoſe inherent? The vital tenſion of the nerve owes its origin to the brain and ſenſitive ſoul, and the nerve would evidently be paſſive in itſelf, was it not illuminated by the radiant beams of the ſenſitive and rational ſoul. Unleſs the ſenſitive ſoul likewiſe was govern'd by the influence of the rational, ſpiritual, and immortal one: which ſhould convey to each particular nerve the due degree of ſenſation, it is certain that the ſentiment muſt ſuffer, or be void, tho' the nerve ſhould be under the actual impulſe of different agents. This will appear infinitely more probable, if we conſider that there are certain moments, where the ſoul retiring as it were within herſelf, takes no cognizance of external objects, notwithſtanding they appear to have the ſame degree of action in the nerves. Deep ſtudy and profound meditation, ſo ſubdue and chain up the powers of the rational ſoul to the objects they purſue, that we have ſome inſtances in hiſtory of the legs being froze without their being perceived to be affected. Perſons who ſleep with their eyes open, neither ſeem to receive or prove any ſenſation from an object applied to their eyes: the ſublime Cicero, in his tuſcular diſputations, has nearly ſaid the ſame thing.

" Nos enim ne nunc quidem oculis, cerni-
" mus ea quæ videmus: neque enim eſt ullus
" ſenſus in corpore, ſed ut non ſolùm phyſici

"docent, verùm etiam medici qui iſta aperta
"& patefacta viderunt, viæ quaſi quædam
"ſunt ad oculos ad aureis, ad nareis à ſede
"animi perforatæ, itaque ſæpè aut cogitatione,
"aut aliquâ vi morbi impediti, apertis atque integris oculis, & auribus nos videmus,
"nec audimus, ut facile intelligi
"Animum & videre, & audire non eas partes,
"quæ quaſi feneſtræ ſunt animi :"—
Tuſc : Quœſt : Lib. 1. xx.

The ſoul, notwithſtanding, does not always require the mediation of the ſenſes, ſhe conceives ſeveral ideas, as it were ſpontaneouſly, and theſe conceptions determine certain actions in different organs, correſponding with them. Does not the ſoul produce many new and diſtinct ideas in ſleep, and in what a natural manner do certain ſleep-walkers perform the different actions of them that wake. The difference is, only, that theſe ſpontaneous wanderings are occaſioned by a reminiſcence, or a kind of creation of ideas, depending on the perceptive faculty of the ſoul, or the ſentiment alone. For although the nerve may have certain perceptions in itſelf, or rather in that part of it which is more immediately affected by an impulſe, yet there are in the extremities of the nerves, all the concurring circumſtances, to enable it to eſteem each different kind of ſentiment. But then we muſt ſuppoſe that every impulſe ſhould be transferred to the ſenſorium commune, which may be call'd the ſanctuary of the ſenſations, and where all the different nerves, devoted to the various affections of the body, converge in one point. In this admirable point of the ſoul, according to Malphigius, between the ſpinal marrow and the brain, the electric vibrations of the whole nervous ſyſtem, excite the ſenſitive ſoul to compare the different ſenſations, which muſt be tranſmitted to the reaſonable ſoul, to be determined and confirmed. For it may be ſuppoſed that oyſters, crabs, lobſters, and the different claſſes of polypi and zoophytes, feel immediately in the wounded part, as they do not appear to have theſe points of reunion, which unite, collect, and determine the ſenſations.

It may not therefore be improbable to ſuppoſe that the nerve diſtinguiſhes and perceives in itſelf. The ſenſations may then be defined a limited ſentiment to the part impell'd, a paſſion or affection of either pleaſure or pain in the nerve or nervous matter, and in the part of the nerve ſtruck or impell'd by the action of an external object. The ſentiment is, more properly ſpeaking, a kind of ſenſation concentrated within the ſenſitive ſoul, and operating certain modifications in its manner of exiſtence. The ſenſation is a local ſentiment, indefinite and material; on the contrary, a reflected ſentiment reſults from a compariſon in the point where the whole of the ſenſations are concentrated, the ſanctuary in which they are preſerved, under the care and protection of the ſenſitive ſoul. It is a reflected act, and a modification of the reaſonable ſoul, which judges and eſteems the ſenſations relative to the preſervation of the animal and herſelf.

These ideas of the ſenſations ſhould only be conſidered as a mechanical theory of their action, and to prove there are different centers of ſenſibility, abſtracted from that univerſal entelechia which comprehends the aggregate of our ſenſations. For the human ſentiment does not require the preſence of this entelechia, until the whole circle of the animal œconomy is compleated and perfected; as we are to conſider, there are as many different modes of exiſting, as there are different modifications of our corporeal ſubſtance. For life is not the ſame, but differs eſſentially in every perſon, and that not only as relative to the peculiar conſtitution or organization of each reſpective being, but varies in different ſtates of the ſame individual. Obſerve in the ſtate of the embrio, how our ſenſations and perceptions increaſe in proportion as our different organs unfold themſelves, for it is only by degrees that we arrive at the complete period of human exiſtence, when the perceptive faculties of our ſouls, and the complete organization of our bodies, are finiſh'd and perfected by the creators care. But as my intention is to trace this ſentiment thro' many ſtages of its exiſtence, I ſhall begin by conſidering it in its corpuſcular ſtate, under the firſt principles of animated beings.

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THE PRIMITIVE SENSATIONS IN ANIMATED BEINGS CONSIDER'D.

IS it poſſible that the world can have been ſo long, and ſo triflingly amuſed by the revival of the ancient ſyſtem of Anaxagorus. The circulation of little eyes, little noſes, little arms, legs, &c. thro' the maſs of blood, is almoſt as probable as the celebrated ſyſtem of organical molecules. Or is it any wonder from our love of novelty, that Lewenhoeck, with his microſcopical viſions, ſhould at firſt have ſurprized us; but it does no great honor to the learned, to let it overthrow the maſterly obſervations of Ariſtotle, or his Sectators, Fabricius, Harvey, Graaf, Gleſion, &c. Such works, from their own merit,

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muſt in time prevail; but as the celebrated Lord Verulam has obſerved, *Veritas filia temporis.* By whatever happy privilege it was Meſſrs. *Lewenhoeck and de Buffon diſcovered the perfect rudimental ſketches of different animals, in the ſpermatic fluids, I know not; their real exiſtence, however, ſtill remains uncertain, and ſeveral objections have been formed againſt this ſyſtem. Was I inclined to oppoſe it, I might find ſeveral of them; or, on the contrary, was I deſirous of attributing the origin of the fœtus to the female, I ſhould not even want for ſectators to that ſyſtem. A certain French author has been as happy with his microſcope to diſcover the rudiments of the embrio in the ovaria of the woman, as theſe gentlemen to attribute it to the production of the male.

" L'Anatomie nous produit des ovaires
" dans les femelles vivipares. On peut regar-
" der les veſicules qui les compoſe comme
" les veritables œufs. Un grand anatomiſte
" avoit prouvè il y á long temps, l'exiſtence
" de ces œufs, il etoit parvenu a diſtinguer
" le fœtus dans une veſicule qui tenoit en-
" core

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* Philoſophical Tranſactions. No. 284.

" core a l'ovaire. Mem. de M. de Littre
" Mem. Acad. Sci. 1701."

But as it is intirely foreign to my deſign, to enter into the various reſearches made by anatomiſts into the animal ſtructure, or to examine the different ſyſtems that have been founded on this hypotheſis; I can only lament with mankind in general, that they have coſt ſo much intenſe application to the diſcerning and induſtrious Lewenoeck, de Buffon, Graaf, Valiſnieri, &c. and been productive of ſo little real advantage in explaining the myſtery of generation. Have the anatomiſts been more ſucceſsful in the diſcovery of the firſt rudiments of animal exiſtence? Not at all; for although they have by the aid of the microſcope and ſcalpel, reduced nature to her minuteſt fibre, and flattered themſelves, that in diſcovering the labyrinth by which bodies were connected together, they might find out that of their conſtruction and growth, yet they ſeem ſtill to be as far from the truth.

Where then can we lead our purſuits, to determine ſomething more certain on ſo obſcure a matter? I anſwer, Would we receive ſuch certain fruits from our labours, as are not to be ſo ſoon blaſted, but which muſt exiſt as long as nature follows her ſame invariable law, let us purſue the ſublime paths mark'd out by the diſcerning Ariſtotle, Macrobius, Harvey and Malphigius. For the phænomena which the unfolding of the different organs of the chicken in the egg, preſent us with, will give us a laſting and true ſketch of the progreſs of the embrio, through the different rudiments of animal exiſtence.

Will it not however appear a great paradox to ſome perſons, what Lewenhoeck* has advanced on the primitive fibres of all organized beings. He tells us the firſt fibre of the flea is as large as that of the ox, and all of them ſo peculiarly organized, that they are equal in every ſubject. Without changing either their figure, or their ſize, they become perhaps more extended, more or leſs complicated, but in fact they are the ſame in every ſpecies of animals. For as they direct the material principles of animal bodies, are faſhioned by the ſame hand, caſt by nature in the ſame mould, they can have no material difference among them.—The celebrated M. de Bordeu*, ſo much the ornament of the French nation, has ſaid, that not only the conſtitution, the ſtate, and primitive diſpoſition of the fibres were the ſame in the body of man, but that every organ was compoſed of the ſame number of fibres, in adults of both ſexes, as in children. This regularity perfectly correſponds with the univerſal law of nature.—The muſcle of the giant has no more fibres to compoſe it, than the ſame one

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* Lewenhoeck was an excellent optician, I mean ſo far as relates to the making of ſpectacles and microſcopes, and our ſenſible men ſeem determined to call all the microſcopical obſervations of this gentleman, by no other name than the reveries of Lewenhoeck. To give a ſpecimen of his diſcernment:—Endeavouring to eſtimate the dimenſions of a muſcular fibre, he ſuppoſes the fibre of an ox to equal the bulk of one fourth part of a hare, and compares the muſcular fibre of a rat to that of a hog and ſheep.—Sometimes he ſays they are larger than that of the ox, and ſmaller than that of the whale: and in another place he contradicts himſelf, ſaying that the muſcular fibre of the ox is the largeſt of all quadrupeds. Not only in the ox, but ſometimes in the ſame animal he tells us this fibre is ſometimes

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larger, or again he will ſay it is ſmaller. Although Mr. Haller has ornamented theſe reveries with the flowers of his erudition, yet he has done very little towards immortalizing the name of the once ſo much admired Lewenhoeck.

* Recherches ſur le Tiſſu Muqueux. § 18, 19.

one in the child; it may appear a vague ſuppoſition, but the contrary cannot be proved: this opinion thefore is more than probable. For if the muſcles are the ſame in every man, their figure perfectly ſimilar, and adapted to the ſame uſes; why ſhould the number of their fibres be different? Moreover, theſe fibres ought to have the ſame organization in every ſubject, conſequently the ſame diſpoſition and aptitude to motion and ſenſiblity. This diſpoſition being univerſal, it muſt therefore characterize the animal fibres, juſt the ſame as it does the orginal plaſtick virtue in metals, and the architectonick cryſtallization of ſalts. And as the ſame degree of force muſt exiſt likewiſe in every primitive fibre, tho' they may be deſtined to compoſe the proto-type of various kind of animals, we may perhaps be allowed to conclude, that it is the number of fibres and modification which diſtinguiſh their *genus*. We are to conſider, however, that the difference we find in animals of the ſame ſpecies, relative to their bulk and ſtrength, does not ſuppoſe an increaſed number of fibres which compoſe their muſcles. The moſt pamper'd and vigorous hunter, by neglect and hard exerciſe, becomes lean and feeble, and the hard rode hackney, gets both ſtrength and fleſh, when abandon'd to a ſtate of repoſe and good paſture. It is not poſſible to prove that the one augments the number of his fibres, and the other loſes, or that they increaſe in diameter or real force, in either of the animals. Would we know the cauſe of this apparent change, we ſhall find it in the cellulary-membrane. It is this mucual web which diminiſhes the force in ſome organs and increaſes it in others, in proportion as it gives the nervous fibrils a more or leſs unconſtrained liberty of their action, or may contribute to their plumpneſs and ſize by its adherence to them.—It may be aſked, perhaps, what is meant by primitive fibre; to which I anſwer, that as I am by no means the inventor of Mr. Lewenhoeck's ſyſtem, of courſe I am incapable of deſcribing what he intended by that term: but it is probable he meant the ſmalleſt atom to which it was poſſible to reduce the apparent fibre of any muſcle, as it is certain that the grain of ſand is diviſible into as many parts as the ſtupendous rock.

I ſee no inconveniency however to ſuppoſe, with Leucippus, Epicurus and Democritus,

mocritus, the origin and formation of things to proceed from atoms; which atoms we may ſuppoſe to contain the active corpuſcles of their reſpective arche-type: but then they are to be conſidered rather as different ſparks of elementary fire, than determined objects of exiſtence; for altho' they are form'd, and have received their different impreſſions from the almighty hand of the creator, yet they are deſtitute of ſeveral properties which are abſolutely eſſential to their real exiſtence.—Thus for example: an atom may contain within its boſom the future rudiments of the plant, but then it requires the reunion of ſeveral concurring cauſes to make it unfold and nouriſh the corpuſcule, which is comprized within its bulk as an embrio. For altho' the grain of muſtard contains within itſelf the rudiments of the plant's form, yet it requires the aid of the vegetative principle which it receives from the earth, to make it unfold its different membranes, and enable it to extract and elaborate that ductile mucus, which it converts to its uſe, and appropriates to the ſeveral neceſſities of its own exiſtence: for it either adapts it to fill up the extended membrane, as it expands, ſending it into its receſſes, or receives from it a freſh degree of active principles to repair its ſpent forces, and enable it to extend the circle of its life.—This will appear more probable to thoſe who conſider that the nutritive and generating principle is an animal mucus, which in different beings is alter'd and adapted to their own peculiar ſtructure: and that the different elaborations of this primitive mucus, is what conſtitutes likewiſe the different life or nature of the being. For we are to conſider that this matter is elaborated in a different manner to the nature of plants, and the vegitative kingdom, than it is in the zoophytes, or the ſuperior claſs of animals. Even the ſuperior organization of the mucus will not only render it more capable of ſenſibility, but of motion alſo, and diſpoſe it more or leſs to become proper for receiving the animating eſſence of the electric fluid.

Some modern authors ſeem to think that the original atoms of all beings do exiſt, although by their infinite minuteneſs they are incomprehenſible to our ſenſes. We are obliged to the ingenious Meſſrs. Tremblé and Bonnet, for their purſuits on theſe ſubjects: M. Bonnet, in his fundemental principles of generation aſſures us, * that every organized body, offers to us in its minute ſtate the ſame eſſential parts, which it is to unfold and diſcover to us, after the accompliſh'd term of fecundation. And he ſays again, † "If we can trace the manner, in which the different parts of the chicken expand themſelves, after fecundation, and the various phaſes under which they ſucceſſively declare themſelves, may we not rationally infer from thence, that it is the ſame in every organical production, and are all included originally in their minute ſtate, under the ſame fold." It is this primitive ſtate, which is call'd the ſeed, (Germe) and although the fluids are not organized, the ſeed is, and has been from the beginning. Even when it offers itſelf to our eyes, under the deceitful appearance of a fluid, yet it has its veſſels, and theſe veſſels acquit themſelves of their eſſential functions. §

M. Tremblé tells us in his preface to his eſſay on organized beings. He conſider'd the expanſion of matter, (evolution) as the moſt conformable to obſervation, and the true

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[*] Principes fondamentales de la generation, ſur les ſonges de M. Bonnet.——D. 25.

[†] D. 179.

[§] D. 154.

true philoſophy. And I ſuppoſed, ſays he, every organized body to exiſt before fecundation, conſidering this act no otherways, than as the means which was to accompliſh and diſplay the parts of every organized being preexſiſting in its minute ſtate, in either the ſeed or the egg. Again in the ſecond page of his firſt volume he adds, reaſon looks with pleaſure on the ſeed of plants, or on the eggs of animals, conſidering them as minute worlds of organized beings, which are deſtined to ſucceed each other, thro' the long period of revolving ages.

The great degree of reputation which Meſſrs. Bonnet and Tremblé have acquired, not only in Switzerland but in France, Germany and Italy, and moſt parts of Europe, tho' but little known as yet in England, will however be a ſufficient ſanction to me, to conſider every atom as organized previous to the ſtate of their manifeſt exiſtance. Although I have ſaid before, their inconceivable ſmallneſs may have hid them from our obſervation, yet it is probable to ſuppoſe, that each reſpective atom has received the impreſſion of the Almighty ſeal, to diſtinguiſh its eſſence and figure.—And as the laws of fecundation ſeem to be the firſt principle of action, the primum mobile of all organized matter, being once aſſured of the poſſibility of organized atoms, we have then only to prove how animality is conveyed into their ſketches to endow them with motive faculties. Now, if all organized bodies have exiſted in their corpuſcular ſtate, till they received their firſt impreſſions of life, it is probable to ſuppoſe, they muſt have ever remain'd in that ſtate of inſenſibility, till they were animated by the fecundating powers.—For fecundation can never move atoms which are not duly organized and diſpoſed to receive this animating impulſe, or can organized bodies receive their firſt principle of motion without being fecundated, it is therefore from ſuch mutual diſpoſitions between the diſpoſed atom and the fecundating principle, that nature ſeems to repair her general diſſolution, forming, by ſuch means, a proper ſucceſſion of beings to ſupply thoſe which fall off.

We are to obſerve alſo, that if nature has given life unto various beings, ſuch valuable bleſſings have only been conferred on certain conditions of exiſtence. For we do not live but to increaſe, and increaſing brings us at laſt to the ſtate of perfection, which is to be ſucceeded by the decaying periods of hoary age. For in life, as in nature and diſeaſes, we manifeſtly can diſtinguiſh three different periods of our nature. The ſtate of growth includes generation, leading us on to the ſtate of perfection, and afterwards to that of decay or diſſolution. In diſeaſes we remark their growth, criſis and decline: in man; youth, manhood and old age. The ſtate of growth denotes therefore a ſtate of decay, and youth would always in an uninterrupted courſe, be regularly ſucceeded by old age, did not the interception of accidental cauſes, cut ſhorter the thread of our exiſtence.

It is intended in the following enquiry into the principles of animated beings, rather to convince by real facts, ſo far as we can eſtabliſh them from obſervation, than to perſuade by the force of logical arguments.—We ſhall examine the conſequences produced by the electric fluid in governing the whole circle of animal exiſtence, not from the probable action alone, but from the apparent poſſible influence it exerts in all active beings. But in order to avoid the diſputes which have employed the time of ſo many learned authors, concerning the definition of words, I ſhall beg leave to enter into certain terms of convention with the reader, concerning thoſe which I am going to eſtabliſh, I flatter myſelf they will aſſiſt him in diſcovering with more eaſe, what I would wiſh to mean by them, and give him a clearer idea of the ſubject. To proceed therefore,

We are firſt to conſider that a certain faculty is contain'd in the atmoſphere which ſurrounds our globe, ſo eſſential to the life of all animals, and the growth of vegetables, that the firſt could not exiſt, or the latter vegetate without its influence. This elementary igneous principle of the atmoſphere, is perhaps the firſt probable cauſe of every phenomenon in electricity. It is that ſpirit which ſeems to afford a pabulum to all terreſtial fire, to prolong the vibrations of ſounds, and continue the effects of light. What I mean by this principle, is by the generality of perſons call'd the * elementary fire. But yet it is to be

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* Ce feu elementaire n'eſt il pas un principe do l'electricitè puis qù au même inſtant au même clin d'öeil le coup, èlectrique ſe fait ſentir a trois cent perſonnes a la fois rangès a la file—Le premier eſt

be particularly underſtood as contained within that portion of the atmoſphere only, which is more immediately connected with the ſurface of our earth, differing very eſſentially in its nature and effects on animated bodies, from that pure and too virgin air, which is to be found above the ſummit of the Pic of Teneriffe, or the mountains of the Cordileras in South America. It is that inflammable principle which we diſcover in lightning, or in the electrical fire, analogous perhaps with the phoſphoric flame, which naturally affords a gentle and innoxious heat, and ſo terrible an one when irritated. We may ſuppoſe likewiſe, that this principle derives great part of its different phenomena from the central action of our globe itſelf. It is however foreign to my preſent intention, to enquire into the properties of the air, I ſhall only add by way of convention, that by the term *elementary principle*, I would be allowed to comprehend all theſe qualities in one, which may convey the idea of that firſt principle with which every being in nature is animated, as the reſpective portions of it appear to be appropriated to them.

Our

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frappè le dernier ſent le coup dans l' inſtant même
——Singularitès de la Nature de Voltaire.
P. 105. C.32.

Our greateſt difficulty will be to fix with ſome probable degree of certainty, what are the cauſes and properties of the electric fire, that moſt ſubtle and very mobile matter, which is contained in every body, and penetrates every medium.

Some philoſophers have compared this fluid, with the æther of the antients, that univerſal agent which the Greeks conſider'd as the inſtrumental cauſe of every operation in nature, and whoſe infinite and variable motions ſhook every other part of matter. Our celebrated Sir Iſaac Newton agreed with theſe philoſophers in conſidering the electric fire as a very ſubtle and elaſtic fluid, penetrating every ſubſtance and filling the whole expanſe of the univerſe by its ſpring. In his experiments he found the elaſtic force of it to be much greater than that of air, when conſider'd with reſpect to its own denſity. From other obſervations he became capable of aſcertaining, that this fluid was diſtributed unequally in almoſt all bodies, depending on the various denſity of them. The more denſe bodies are the fewer pores they contain, and the æther they poſſeſs is rarer, ſo as on the contrary the rarer the body the denſer is this fluid. For this reaſon we find it rareſt in denſe ſubſtances as gold, and denſeſt in rare ſubſtances as a vacuum. Mr. Wilſon imagines the electric fluid to be the ſame with that which cauſes the reflection and refraction of light.

There are certain ſubſtances likewiſe, which this fluid can either penetrate into or eſcape from with more or leſs facility, for glaſs, amber, wax, reſin, or ſulphur oppoſe the currents of the electric matter, with more violence than other bodies. Even air will reſiſt more in general than thoſe ſurfaces which are non electric, and columns of the ſame air oppoſe the actions of this fluid, in the ratio of their volume; ſo that a column of air of an inch diameter, will reſiſt leſs than one of a foot, and this in proportion leſs, than a column of three feet diameter. Round ſubſtances will alſo reſiſt the electric fluid, more than thoſe which have obtuſe angles, and theſe laſt, more than thoſe which are acute.

We may therefore, without any impropriety, be allowed to conſider the properties of the ætherial principle, as intirely conformable to the phenomena of the electric fluid, as in fact, the electric matter, ſeems to be no more than the ætherial principle itſelf, loaded with the groſſer particles of bodies thro' which it has forced a paſſage. This ſuppoſition is intirely conformable to the ſentiments of Sir Iſaac Newton, who diſcover'd that every body in nature was ſurrounded by a very denſe atmoſphere. The ſame with that I have call'd by the name of elementary principle. And it is certain that the action of the ætherial principle, in animated bodies is more evident, than in thoſe which do not ſeem to poſſeſs ſuch a property. So that in all bodies, but particularly ſo in animated ones, we find a reciprocal action between the elementary principle or atmoſphere, which ſurrounds them at a ſmall diſtance, and the *ætherial* principle which enters into their compoſition*.

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* The ætherial principle brings us nearly to the ſentiments of the Stoics. It correſponds with what the antients call'd the perfect light of the ſenſitive ſoul, or the ignis intelligens, principles which they conſider'd as the origin of all motion, preception and reaſon in man.—The ætherial principle is compatible likewiſe, with their ideas of the nature of the world, when they ſaid, the ſoul of the univerſe was all on fire.—We find even that Cleanthes attributed the cauſes of the contractions which the heart is

Theſe phenomena are ſo conformable to that univerſal principle which directs the whole of natures works, that it requires very little art to comprehend them, nor can we be ignorant of the effects, which the action and reaction of theſe principles produce upon ourſelves. In the vernal ſeaſon of the year, when the invigorating action of the ſun, rarefies the circumambient air, and diminiſhes its elaſtic force, the internal principle which is placed within every animated part of nature, begins to manifeſt its action.—The leaves of plants, the moſt tender part of their nature, which had been deſtroyed by the froſts of winter, now ſhoot forth again: for the rigor of the freezing air, oppoſes too great a degree of reſiſtance to that internal principle, which rules within them, and by concentrating its powers, place a barrier to its action. So does the cold of winter increaſe the animal heat of man internally, becauſe it concentrates it more, and the ſkin by its action, becomes

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obſerved to continue for ſome ſmall time when taken out of the body of the animal, to a ſenſitive fire. He ſeems to have intirely meant the ſame thing which Mr. Haller calls irritability, and Dr. Fouquet a ſpark of the remaining ſenſibility of that muſcle.

comes corrugated*. Hippocrates tell us, Ventres hyeme & vere natura calidiſſimi ſunt. Such antagoniſm between the external and internal agents of animated beings, is evident from obſervation.—The egg fecundated by the male, contains within itſelf the complete portion of this propulſive agent, for the hen by her incubation does not impart any virtue to her egg, but only rarefies and warms the exterior air, by her feathers, and the influence of her own animal heat, which by diminiſhing the action on one ſide, exerts it on another. We find that the warmth of ovens, or a ſpirit of wine lamp, or the heat of ſand, are either of them capable of perfectioning the organization of ſuch beings, when they have already received the due portion of the electric influence. By this rarefaction, plants alſo which only blow with us during the heats of ſummer, become perennial under the tropics. Even in our own climates, certain plants ſeem to contain ſo great a quantity of this ſubtile matter, that they continue in leaf, and yield their fruit, unhurt from all the rigors of our ſevereſt winters. Such are the Holly, Miſletœ, and certain ſpecies of the Firr.

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* Apporiſm, 15. ſect. 1. editio Albert de Haller.

It ſeems then, that the more abundantly this electric influence is ſhed in animal bodies, they become more perfect, and leſs ſuſceptible of periſhing from the various changes of the elementary fire. Some ſpecies of zoophytes and plants, have this property nearly in the ſame degree, hence their analogy; but the claſs of animals, poſſeſs a more abundant portion of it, ſo as to give them a locomotive power. For without thoſe quick irradiations of this *æther* through the ſtructure of animals, they would become fixed to the ſpot, from which they received their exiſtence, and like the imperfect zoophyte, obey the moving impulſe of any foreign agent, which ſhould act againſt it.

We cannot eaſily eſtimate what are the aggregates of the perceptive faculties of animated beings, unleſs we conſider them from their element. Nor will our enquiries into the properties of the primitive fibre of animals, afford us a more perfect knowledge of the nature of their perceptions. The anatomical analyſis of bodies, will hardly lead us to the truth, unleſs we are guided in our enquiries by a philoſophical examination of them. That is to ſay to proceed, from an enquiry into the nature of the moſt ſimple to the moſt complex'd ſtructure of animated beings, *è particularibus ad generaria*, as the ſchools teach us, in oppoſition to the ſynthеſis which goes *de generalibus ad particularia*. With this view we ſhould conſider, the order of natural things which enter into the ſtructure of beings, and compoſe their eſſence, ſo far as this order relates to the elements of their compoſition and the matter of which they are form'd; I mean their material parts.

The elementary fire, and the innate æther of animals, have already been ſuppoſed to contribute to their growth, perceptions, and exiſtence. We ſhall conſider in the next place, what are the conſtitutive principles, which compoſe the material parts of animated beings.

Following then the analetic order, I ſhall endeavor to inveſtigate the principles of organized beings, under which, the matter of this organization muſt neceſſarily be included.

If we conſider the phenomena of life with attention, or examine rather profoundly into the cauſes of it, it does not ſeem improbable but we may trace it from its beginning; at leaſt an apparent fixed point may be diſcover'd on which we may found the circle of exiſtence; and which may either be call'd the firſt material point, or the living *molecule*, as it is beyond doubt the firſt ſenſible element of animated bodies.

This point is what has been already mention'd when ſpeaking of the cicatricula, and is repreſented in the firſt figure of the firſt plate. Upon the ſurface of the yolk of an egg, and nearly about the middle is to be ſeen floating a ſmall veſicle, ſurrounded by a membrane of the moſt exquiſite tenuity, and fill'd with an exceedingly tranſparent mucal or gelatinous humor. Within this veſicle a ſmall white line may be perceived ſwiming in the tranſparent humor which extends the veſicle. Its extremity is ſcarce ſo large as the point of the fineſt needle. Now it is evident that this material point, or white line, contain'd within the cicatricula of the egg, muſt be the firſt elementary fibre of the animal. But what will ſtill redouble our admiration is, that this firſt rudimental point ſhould be already endowed, even in ſo uninformed a ſtate, with both a degree of ſenſibility and of motion. It has a life. Hervey and Malphigius have both of them obſerved this wonderful property of the primitive molecule, in the ſtate of an atom. And we may ſuppoſe alſo, even as an animal rudiment it is poſſeſſed of both ſuch general and common properties, at the ſame time that they may be applied not only to itſelf, but to every different ſpecies of beings which partake of the nature of animals, * and are endowed with apparent loco-motive powers. In every being perfectly organized, this animated point within the cicatricula may be called the firſt rudimental principle of the nervous ſyſtem. For the primitive molecule will be the ſame in man and all animals, as it is in the chicken, becauſe every being where a nervous ſyſtem has been found requiſite by nature to direct the current of the animal fluids, ſhould have a firſt principle from which it ought to be perfected. Would we determine the portion of ſenſibility which we find inherent in this primitive

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* Baglivius de fibra motrice, p. 263. Simpliciſſimorum profectà organorum ſtructura in omnibus penè animantibus, una eſt eaque ſimilime.

primitive fibre, we are not to ſuppoſe it to be endowed with more than a phyſical exiſtence relative to the ſtate of molecule. Or if we ſuppoſe it varying in every claſs, relative to the excellence, or the exalted degree of the perceptive faculties of the being of which it forms the rudimental ſketch, we muſt then declare the entelechia of the ſenſitive powers to reſide within the cicatricula. But there are more reaſons than one, for denying the aggregate of the perceptions to be included within the firſt nervous fibre, as I do ſuppoſe there are different portions of ſentiment diſtributed to every part of the animal, ſo that thoſe organs which have not yet received their form, can never enjoy their ſenſibility, more particularly ſo, as this ſenſibility depends intirely on the ſtructure and modification of the nerve in them. We may ſuppoſe that the nervous compendium of the animal is included within this *cicatricula*, becauſe we find the various parts of the material ſtructure, forming themſelves by a continued progreſſion until the whole is completed. Experience teaches us likewiſe, that either thro' ſome defect in the quantity of animating æther, or a hurt, obſtructing the progreſs of the molecule expanſion, the animal may not only become deformed as to its ſtructure, but its ſenſitive faculties be diminiſhed alſo. It is very probable therefore, and ſuch was the opinion of Willis, that this ſpark of animation in the primitive material atom, ſerved only to adapt it to an intimate union with the reaſonable or immortal ſoul. Indeed it is ſcarce to be imagined that the ſenſitive faculties could incorporate themſelves within mere paſſive matter, if this matter did not, even in the ſtate of atom, enjoy a degree of incomprehenſible exiſtence from the touch of the *Great Creator*. The ſenſibility then of animated bodies, abſtracted from the divine influence, appears only to be a ſubtile and pure ſubſtance, participating in ſome degree of both the material parts of bodies, and the influence of the elementary fire: or, it ſhall be in other words, a ſimple property which however is peculiar to organized matter alone, directed by the claſs of agents or thoſe general principles, which are every where to be found. I mean attraction and repulſion. It is however certain, that this ſubſtance or property ought to be conſider'd as uniting both the matter and the ſpirit, and that the principles of attraction and repulſion are the ſentive faculties of the animal molecule

This will appear more evident as we proceed in the inveſtigation of the ſtructure of animated beings in the embriotic ſtate, previous to which we ſhall examine what we have ſo often called the *matter* of organized beings.

If we may attribute univerſality to any one thing in nature, we ſhall find on enquiry, that the ſubſtance which I have ſo often call'd by the name of *mucus*, moſt deſerves it. It ſeems to poſſeſs every requiſite as a general principle, becauſe it is to be found in every ſubſtance in the univerſe, whether animate or inanimate. Even when the caput mortuum has been rejected by the chymiſts, it ſtill contains ſome particles of this matter: ſo that this laſt ſubſtance, and the mucus or material principle of animals, are the two extremes of this agent. This is what we ſhall proceed to conſider and inveſtigate.

The matter which the Latins call'd *mucus*, is the ſame thing which we call a ſlime, and the French mucus; but it is conſider'd in this place in a much more extended ſenſe. By the term mucus, is underſtood, a ſubſtance which compoſes the material parts of every thing which is to be found upon the terraqueous globe. It is the firſt component and material principle of all organized beings.—In plants, and the different claſſes of the fungus, this mucus is the ſap or gum. In animals a colliquated mucus. In zoophytes, the oleaginious particles of water, uniting certain terreſtial principles. In ſhort, the different orders of this mucus is not only the corporeal matter of animated beings, but the ſubſtance which nouriſhes them alſo.—From the propenſity it has to change by fermentation, it becomes poſſeſs'd alſo of either a natural or vegetable ſenſibility. So apparent is this truth, that in the youthful ſtate of plants, even thoſe which are the moſt poiſonous and cathartic, this mucus is at firſt only a ſimple and innocent ſlime, a dew or *ros vitalis*, which at this time neither contains any poiſon, or does it purge, becoming only more mucilaginous as it circulates thro' the fibres and veſſels of the plant, receiving by degrees a peculiar conſiſtence and fermentation,

ation, 'till it is fit to be appropriated to the nature of the vegetable in which it circulates. In other plants, the mucus by tranſuding through their pores, join'd to its natural propenſity to concrete, and the additional influence of the circumambient air, hardens into a reſin or gum. Not only vegetables, but animals alſo are derived from this ſame principle: an animal, at the moment of conception, is a bulb of mucual matter; ſuch are the mucilaginous humours of the chicken in the egg. We ſhall not conſider the nature of the mucus as appropriated to the vegetable kingdom, but confine ourſelves to the inveſtigation of it in the animal.—

The mucus is a gluey or viſcous ſubſtance, of a gelatinous appearance, and is either more or leſs fluid and coagulable, circulating through every organized being. It is, as I before obſerved, the principles and eſſence of animals in general, and the conſtitutive material parts of man. It compoſes not only the eſſential juices, but the ſolid parts of his body alſo, forming the matter of the bony ſkeleton and muſcles, and circulating in mucual ſtreams through the different veſſels of his ſtructure. It may be compared with the mucus of what the chymiſt call the *animal plants*, as it ſeems to have ſome analogy with the whole tribe of thoſe which Tournefort diſtinguiſhes by the name of *cruciſormes*, and Linnæus calls *tetradinamia*. So that this mucus or mucor, is that one general ſubſtance ſhed throughout the whole univerſe, and compoſing the parts of every different claſs of organized beings.——

The obſerving and philoſophical phyſician will diſcover from ſeveral peculiar properties of this matter, how much it is adapted to the compoſition of organized and animated beings. He will remark its ductility, its gluey and ropey nature like ſirrups, the property of concretion which it is ſo evidently poſſeſſed of, ſo as from the ſtate of the moſt perfect fludity, to indurate into a bony hardneſs, *or a ſtony ſolidification. The different modifications of its conſiſtence are ſo varied, as to comprehend almoſt an infinity of combinations.

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* Clopton Havers, Nova Oſteologia.

Beſides theſe general phænomena which we obſerve to be common to this matter, we are to conſider it as poſſeſſing one property peculiar to it alone, and in which it differs from every other ſubſtance in nature: that is, the fermentiſcibility, or the exceeding aptitude to ferment, above all to a putrid one in animals. We may preſume therefore, that it is ſuch fermentiſcibility in either the human ſtructure or that of animals, which diſpoſes the mucus to undergo the various modes of organization. For fermentation may give to this ſubſtance a greater degree of ductility, and pliancy, and does probably ſo change it, as to render it more diſpoſed to receive that aſtoniſhing principle of its vitality.—And as the chymiſts have long ſince obſerved, that certain fermentations produce a phlogiſton, ſo may we preſume by the ſame reaſon, that the action of this fermenting principle, does excite in the mucual ſubſtance, a ſmall degree of *ignited* ſpiritueſſence.—But then we are to regard all theſe different changes in this mucus, produced by fermentation, as deriving their ſources from the influence of the *ætherial principle*. We are likewiſe to remark that in every different being, this mucus is in itſelf more or leſs pure, ſometimes mingled with other ſubſtances, differing as I before obſerved in every being, and in different ages or periods of the ſame being.—So that we are to conſider this ſubſtance in its primitive ſtate of true mucus, as a gum or jelly, a mucilage, of a ſoft oily nature, which tho' they may appear to be different ſubſtances, yet are all of them derived from that general principle which we call'd mucus.—For the mucus which compoſes the body and ſubſtance of plants, zoophytes, and animals, is the ſame in its primitive qualities, and only differs in the mode of its compoſition.—To aſſure ourſelves of the heterogenity of the animal mucus, in different beings, let us ſelect the mucilaginous principles of the egg, by a chymical analyſis.——We firſt diſcover a large quantity of an aqueous or watery principle, deſtined probably to compoſe the *laxam compagem*, or the thready ſubſtance of the organized mucus, which contributes to the ſuppleneſs or flexibility ſo as to diſpoſe the different parts of the animal, for the exerciſe of the vital principle.—Next appears an acid, an oil, an earth, containing a fixed alcali; we obſerve likewiſe a large quantity of air, exiſting in an elementary form, or in ſolitary particles, that is to ſay, it has none of thoſe properties which diſtinguiſh the general maſs of air, excepting ſuch few as are found in their aggregation. But it will be neceſſary to inform the reader, that he is not to confound theſe analytic principles of an unorganized mucus, with thoſe which compoſe the true and perfect part of animals, for otherwiſe he would be deceived in his judgment; as the mucual principles of the egg, yet rude and unformed, may be ſuppoſed to differ in their properties, from the blood, bile, lymph, &c. of the chicken when perfectly elaborated. For we find from our examination, that the ſimple abſtracted mucus, containing the elements of animated matter, offers to our notice ſeveral different modifications, and degrees of maturity, from the ſtate of jelly to that of its perfect animalization. However improbable it may ſeem to thoſe whoſe talents have been employed to enquire into the different ſtructures of fibres, ſuch as the ſimple or compound, nervous, muſcular, or bony ones, yet it is, and remains inconteſtable, that in the primitive ſtate of animals, or every organized and living being, whether animal, fiſh, or zoophyte, &c. was in its unorganized and unformed ſtate, a ſimple, or diaphane and tranſparent mucus. In a word, a mucoſo-gelatinous ſubſtance, inſipid to the taſte, exceedingly ſuſceptible of fermentation in its primitive ſtate, and of putridity in a more elaborated one, particularly ſo as it approaches to the adult animal mucus, or receives the perfect character of animality.

We ſhould likewiſe obſerve the different radiations in the ſenſibility and organization of the animal mucus in the human body. We cut our hair or nails, and they revegitate from the ſame principle, that the ſnail ſhoots forth again its horns, or crabs their claws; for even in ſuch beings as theſe laſt, there are neceſſary principles of life, intimately connected with their exiſtence. The lobſter which can revegitate its claw, would periſh from the loſs of its tail, on account of the veſſels which are diſtributed within its ſubſtance, as the ſnail would probably looſe every faculty of its exiſtence alſo, was the body to be divided in the center, or in that part whoſe ſtructure renders it the moſt eſſential to its exiſtence. It is by the ſame quality inherent in the mucus of the human body, that it preſerves certain faculties of its exiſtence, long time after the death of the individual. Both our hair and nails revegitate again if cut after death, and the celebrated Ambroſe Parè, makes mention of a human body that he preſerved twenty years after its deceaſe, cutting the hair and nails at different times, which he ſtill found to poſſeſs theſe qualities. How then can we poſſibly account for ſuch remaining ſparks of a vital faculty in bodies, deprived, as we think, of every degree of human exiſtence? For as the aggregate of life, is compoſed of all the different modifications of the vital principle united, it ought therefore, in conſequence, when all ſentiment was ſeparated from the body, to become meer inanimated matter. Experience ſhews us, that certain parts of our bodies poſſeſs the ſame degree of exiſtence, as perfect when dead as when living. Of what nature then is the vital principle? We ſhould imagine it muſt by this time appear ſo evident to the reader, how much the electric influence in the material mucus of animals, is of conſequence to their formation, as to want no additional explanation.

That we may render our argument for the electric fluid ſtill more intelligible, we ſhall obſerve. Firſt, that the various modifications which we find in the mucus of different animals, can only render them proper to receive that reſpective degree of ſenſibility, which is to inſinuate itſelf into their matter; that is to ſay, after the Almighty hand, has once deſtined them for certain purpoſes of the general creation, in the corpuſcular ſtate. Now, from the ſame principles, there would be found various centers of ſenſibility in all animals alſo, becauſe there appear various modifications of this mucus in their ſtructure. The entelechia is not then confined to one part of the body alone, but collected from them all. The perfection of man may be derived from the union of all his ſenſations in the brain, and their action on the precordial region, but every part of his body animated as it is, muſt have a certain degree of ſentiment, which is peculiar to it alone, and depending on the property of its material ſtructure, ſo that the nails, or hair, whoſe component mucus is ſo groſs and material, can never receive more than a very ſmall and occult proportion of his natural ſenſibility.

Secondly, we are to conſider, that as the electric influence or the ætherial principle can only manifeſt themſelves in ſuch a certain degree, as the mucus or the material parts of bodies can admit, they may equally reſide in it by longer periods, as the properties of matter are diſpoſed or capable of receiving them. Such is the caſe with the mucus, which forms the nails and hair, which can always admit the irradiations of the ætherial principle, whilſt there remains only the ſmalleſt degree of that matter which has been call'd the radical moiſture of bodies.

The vital principle, or the aggregate of human exiſtence, is, as I have before mention'd, the concourſe of ſeveral different portions of ſenſibility, united together in a mutual dependance, and which are reciprocally and continually acting on each other.—In the firſt part of the work, I obſerved likewiſe, that the nerves were the only active principles of the human body, but I beg'd to conſider them, as poſſeſſing ſuch properties in conſequence only of that divine and ætherial principle which gave them their ſenſibility. Becauſe if the nerves were really active, and poſſeſſed the radical and primitive ſenſibility of themſelves, which we are aſſured is derived from the influence of an animating ſpirit, it is probable that every animal, altho' of a ſuperior organization, would enjoy ſimilar advantages with the zoophytes and malacoſtraca tribe of beings. But it is evident that theſe revegetative principles are wholly limited to this claſs. Far, however, from being a tranſcendent attribute of their excellence, it proves on the contrary, their unformed and inorganized ſtate.—When nature has carefully given a refined degree of perfection to the animal mucus, no ſuch diſſolution, or ſeparation can happen, without equally diminiſhing the perceptions and endangering the exiſtence of the injured being. Although the polypus when cut into a thouſand pieces does not periſh, but forms as many different polypi, or ſnails deprived of their horns, the crab or lobſter of its claws, will revegetate them, ſuch phenomena, are the conſequence of a groſs and inorganized mucus of which their material ſubſtance is compoſed. To beings which are organized in a ſuperior degree, the vegetative principle is ſo impoſſible that even in wounds, whereby the ſmalleſt nervous fibrillæ are ſeparated, it is not the union and prolongation of them which forms the cicatrice, but the nutritive mucus of the animal which fills up the gaping wound, by its concretive quality.

It is therefore probable to ſuppoſe that the nerves of animals which move from the electric impulſe, might as eaſily convey the electric fluid through their ſtructures, as the nervous one. Perhaps they are in fact the ſame thing. Sir Iſaac Newton, in his twenty fourth queſtion, ſeems to think the action or motion in the nerves were produced by the continued effect of the ætherial influence. But in order to give the greateſt degree of probability, to the analogy between the nerves and the electric fluid, we ſhould conſider the effects which it produces on inanimate beings.

We may ſuppoſe every body in nature, to have ſome peculiar degree of electric force, as alſo that the intenſity of it, muſt depend intirely on the nature of the elements which compoſe them. The nerves, therefore, as the moſt refined parts of the animal mucus, are more particularly appropriated to collect the greateſt quantity of electric matter, and convey it to every part of the human body. All the humors, cellulary membrane, and every other part of the animal ſtructure, admit of ſome portion of the ætherial principle alſo, but in a leſs degree. It is for this reaſon the ſubordinate mucus of the human body, may ſtill concentrate ſome ſmall portion of the electric fluid, even after the diſſolution of the animal, and the loſs of the vital principle. Such muſt be the caſe with that revegetation, found in the nails and hair of the human body, which tho' unconnected with the general phenomena of life, yet the ſubordinate quality of the mucus does ſtill continue to poſſeſs ſome portion of the *ætherial principle*, when the entelechia of the ſoul has even loſt its deſpotic influence over the body.

If theſe conſiderations do not, however, afford ſufficient reaſons to eſtabliſh the action of the ætherial fluid, as a general principle which we may apply to every phenomena in nature, and in particular to the ſtructures and formation of animated beings, yet they furniſh us at leaſt with very probable conjectures, becauſe if clear and ſimple obſervations and experiments can have any force, they will certainly have much more, when we can explain ſeveral operations of nature, by their aid, which have hitherto been inexplicable.

Before we quit this ſubject, it will be neceſſary to mention, that there is ſuch an abſolute affinity between every degree of mucual matter, and the ætherial principle, that even the moſt ſimple and unorganized ſpecies of this matter, will conſtantly contain certain portions of the ſubtle principle within it.—Can we poſſibly explain, in any ſatisfactory manner, how certain membranes are formed upon both the animal and vegetal mucus, but by theſe agents?—What can occaſion that membraneous web, which forms itſelf upon the ſurface of milk, ſoups, or any other gluey or mucual ſubſtance, which has been heated? Does it not appear evident that the action of the ætherial principle, which is concentrated within the mucal matter, oppoſes a great degree of impulſe to the preſſure of the elementary principle, contained within the atmoſphere that floats above it, or in the circumambient air.

The primitive ſenſations therefore in animated beings, may be defined to be, the action of the ætherial principle concentrated within the mucal material ſubſtance of the *molecule*. Conſtantly endeavouring to break from its confinement, and tending by its elaſtic force, to expand the ſubſtance within which it is contained, whenever the preſſure of the elementary principle is weakened, or oppoſes a leſs degree of reaction. So that the primitive ſenſations in animated beings, under which I comprehend the claſs of vegetables, may be defined by one word, which I ſhall call by the name of, The Propulſive Force, in animated beings.

* * *

PROOFS

OF THE

PROPULSIVE FORCE,

Exiſting and exerting its Action,

IN THE

ANIMAL MOLECULE.

IT has already been ſhewn that every ſpecies of mucus, whether of the vegetal or animal kingdom, was peculiarly appropriated to collect certain portions of the ætherial principle. It will at preſent be proper to examine how, from a ſimple and apparently homogene matter, we may obſerve the progreſſive formation and expanſion of the material parts of an animated being. We ſhall endeavor to ſhew, likewiſe, how a ſimple and unelaborated mucus

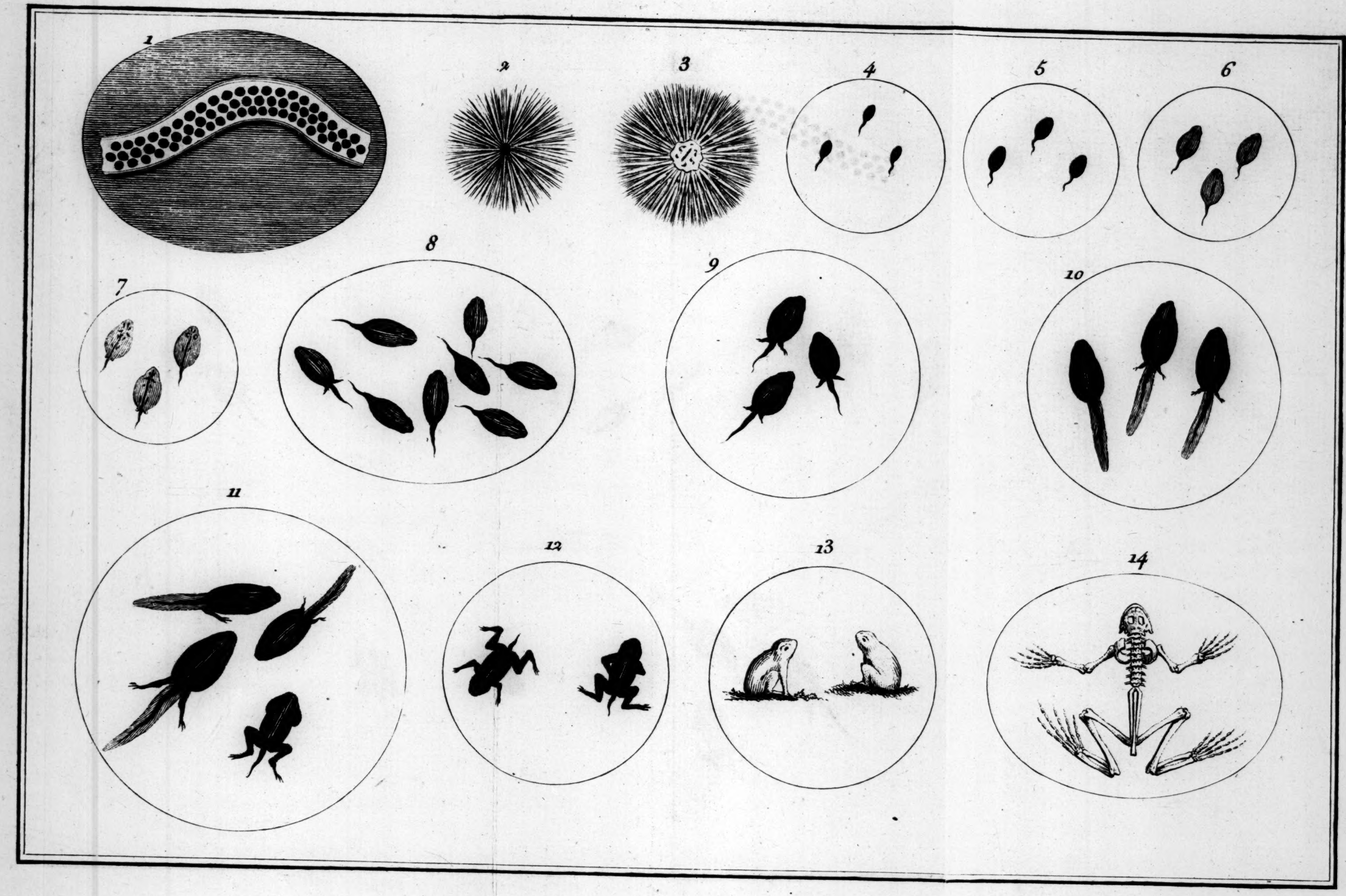
cus does, by the aid of the ætherial principle, complete not only the order but the ſymmetry of the whole animal.

Every animated part of nature is form'd from mucus, and the various elaborations which it undergoes, form the different characters and ſpecies of beings. It is needleſs to inſiſt any more on ſo evident a truth. To give, however, a more perfect idea of this ſuperiority in different ſtages of the ſame being, we ſhall ſelect the frog from the amphibious tribe, and purſue him from its firſt elements to the ſtate of perfection.

The moſt remarkable circumſtance of theſe beings is, that they have no exterior parts of generation, the female has no vagina, or the male a penis, the anus ſerves both the ſexes, not only for the evacuation of the excrements and urine, but the embrio and eggs alſo. Theſe animals have the blood cold, and the electric fluid is excited within them with ſuch difficulty, that they continue for four, eight, or ſometimes ten days in copulation. During this time the belly in both of them ſeems conſiderably ſwoln, that of the female being filled with eggs, and that of the male with a tranſparent jelly; ſometimes the female does not lay her eggs 'till ſixteen days after the coupling, but ſome will eject them in a minute, under the form of a ſtring of beads, united together by a white and tranſparent mucus. Each egg has a black globule, which is the fœtus. The ſpawn of theſe animals when newly ejected, falls by its ſpecific gravity, in the form as nearly ſeen in the firſt figure of the ſecond plate, to the bottom of the water, where it remains for ſome time. But as the *ætherial principle* ſoon begins to manifeſt its action, it riſes in about four hours to the ſurface of the water. Each black globule is a molecule containing the compendium of a frog.

It is a matter of ſome ſurpriſe, that anatomiſts, and phiſiologiſts, ſhould not have been more attentive to ſearch into the ſtructure, and obſerve the metamorphoſis of this animal. Ariſtotle, Fabricius de Aquapendente, Hervey, and Malphigius, have endeavoured with unwearied application to explain the myſteries, in the production of the chicken in the egg.—The laws by which animals increaſe, and are formed, ſtill remain concealed from us. Notwithſtanding the progreſs which the diſcerning and induſtrious eye of man, has made towards diſcovering this hidden chain of natures works, yet the firſt link is ſtill wanting to make it perfect. What numerous ſyſtems have been founded, to explain the cauſes of generation? What hypotheſes? Led away by the fallacious diſcoveries of the microſcope, we have long been enſlaved to the opinions of fanciful obſervers. Few ſenſible people however, do at preſent agree with the diſcerning Lewenhoeck in the diviſion of the globules of the blood, or look upon the ingenious writings of Dr. Martin, on that ſubject, in any other light than a well fancied eſſay.—Even the organical molecules of M. de Buffon muſt yield at laſt to thoſe certain laws which nature ever follows. Creating nothing without its uſes, and purſuing the moſt ſimple methods to accompliſh her great deſign. Not but we may allow infinite merit to ſuch diſcoveries. But it will ſtill remain a matter of doubt, if what M. de Buffon took to be animalculæ, were not the electric radiations, in the animal mucus, which ſtill exerting its powers, might have deceived him. Be it as it will, our lateſt obſervations have confirmed, that animals and vegetables do equally increaſe by a principle which has great affinity in each of them. The internal ætherial principle exerts its propulſive force, when the action of the elementary one is diminiſhed in its reſiſtance. This action and reaction are equally the cauſes of vegetation, as they are of the expanſion of the animal molecule in its primitive ſtate of ſenſibility. To reduce what I have aſſerted to occular demonſtration, I took the ſpawn of frogs, from a ſmall rivulet in the neighbourhood of Montpellier, about the fourteenth day of April, which I put into two different veſſels fill'd with water. I placed the one to the action of the rays of the ſun, and the other in the ſhade. On the ſecond day the propulſive force ſeem'd to put each molecule in motion, for they began to ſeperate themſelves from the general ſtring to which they were connected, and the white mucus in which they were confined, perceptibly diminiſhed, until it became all imbibed within the ſubſtance of the black molecules. The abſorption of the white mucus, left each molecule at liberty, and detached from each other; in about four hours, they became more oval, and at the extremity a ſmall point was to be perceived, which ſoon after form'd itſelf into a tail. Immediately after this formation, they began to move with ſurpriſing velocity, and appeared of the ſize and ſhape as repreſented in fig. 4. I took ſome of the globules of the black mucus, which I put into a ſmall earthen veſſel, with juſt a ſufficient quantity of water to cover them. This was done when they were detached from their common ſtring. My intentions were, to aſſure myſelf, if the *propulſive agent* would not manifeſt a more evident action in the molecule, provided I ſhould leſſen the reſiſting power of the circumambient fluid. The reſult was as follows: I placed the veſſel over a ſand heat, expoſed to the ardor of the mid day ſun, which was at that time very powerful, and I found as the water became rarefied, the molecule extended. I increaſed the heat, to about two degrees more by Reaumurs thermometer, than the natural ſtate of the elements, in which they ſwam, and I obſerved that the propulſive agents in the molecule, had drove out the contained white mucus into ſeveral radiated points, as in the ſecond figure. It is neceſſary to remark, that this appearance differs entirely from the natural progreſs in the generative powers, and may be deem'd, rather a preternatural ſtate of the molecule, as it is owing to the circumambient element, loſeing

Plate the 2. to front Page 88.



ing part of its elaſtic force, and the power in conſequence of counteracting the propulſive agent. I put another globule of the black mucus into a glaſs, with a very ſmall quantity of water, breaking the texture of it with a pin at the ſame time. In about twelve hours, ſeveral radiated points, were formed all round the molecule, as appears in the third figure.

This organization of the tranſparent matter into white radiated points, contrary to the natural progreſs in the growth and ſtructure of this animal, muſt evidently be owing to the power of the ætherial principle, or the action of the electric fluid, contained in the animal mucus. It has already been confirm'd by experiment, that attraction and repulſion are the properties of the electric fluid, and we may obſerve, that the firſt evident action in the animal molecule, is the attraction of the tranſparent mucus into its bulb. This attraction is ſoon ſucceeded by a repulſion and general expanſion of the ſides of the molecule. Does it therefore ſeem improbable, to ſuppoſe the propulſive force ſhould deſtroy the equilibrium of the generative powers, or break through the due order in the progreſs of the molecule, when we find the reacting principle loſing its influence, by being either deprived of its due ſpring, or ſuffering in its faculties, as an oppoſing agent. If we leſſen the momentum of the ſurrounding element, we diminiſh the degree of compreſſion in it of courſe; ſo on the contrary, when we increaſe the denſity of the element, we give a greater degree of reſiſtance to, and hinder the expanſion of, the propulſive force in the animal molecule. This circumſtance was ſtrongly confirmed by the appearance of thoſe molecules, which I had kept in water in a ſhady room, for they had remained (although ſeven days were paſt) in almoſt the ſame degree of action, as when I firſt put them into the veſſel. The others which I had taken at the ſame time, and expoſed to the influence of the ſun, had received the form of thoſe in the fifth figure.

Will it not be natural to conclude, from what has been ſhewn, that animals and vegetables, increaſe and extend themſelves by principles which are nearly analogous. I mean in the primitive ſtate of the former, before they receive their ſuperior degree of excellence, and become poſſeſſed of their loco motive faculties. We find that various changes in the elementary principle, influence the ætherial one in the vegetable, as we have ſeen them do in the animal kingdom.—To proceed in our enquiries.

On the firſt of May, the tadpoles were conſiderably increaſed in bulk, and the *contours*, greatly extended, the moſt remarkable circumſtance, was their becoming perfectly diaphane or tranſparent, excepting in the center. I there perceived a black line, dividing the globular part of their bodies into two equal portions, and joining with the tail, as in the ſixth figure. In this ſtate of the animal, there appears a manifeſt attraction of the mucual matter, to form a black thread, which I found to be the rudimental ſketch of the ſpine.

The fourth of May, I could obſerve an increaſe in their form, and the firſt appearance of the lower extremeties reſembling two ſmall bulbs, one on each ſide of the tail, as repreſented in the ſeventh figure.

Several beautiful phenomena preſented themſelves to my obſervation, as I held the glaſs bowl in which they were contained between my eyes and the light of two candles. I could plainly diſtinguiſh through the tranſparent texture of their bodies, that ſeveral filaments of an apparent denſe ſubſtance, were tracing out the rudimental ſketch of the bony ſkeleton, they appeared more abundant towards the upper parts of the bulb, and particularly towards that part, where they were forming the cranium to protect the brain. Theſe lines were finer than it was poſſible to draw with a hair pencil.

On the ſixth day of May, they began to loſe their tranſparency, but the black line which directed the globular part of their ſubſtance, ſeem'd to appear of a white colour, I could perceive a ſubſtance in the form of a ſmall ring, hanging down from the black line, which by degrees increaſed until it had form'd the inteſtines.—The whole animal motion was at preſent derived from the center of the body. I obſerved when the animal was in a ſtate of reſt, the black line was perfectly ſtraight, but when it would move itſelf, it contracted the extremity of the tail, and the head nearer together, by forming with this line, the ſegment of a circle. I perceived in ſome of the tadpoles the ſmall point, which I had remarked on the left ſide, now adhering and hanging as it were to the ſpinal thread, and I obſerved the perfect traces of the cranium, reſembling lines of nearly one third of the diameter of a human hair. They are repreſented in the eight figure.

On the eight day of May, I firſt perceived their eyes. The ſpots on each ſide of the tail, were now formed into legs, which the creatures made uſe of to increaſe their motion. They reſembled in form the ninth figure.

By the thirteen of May, they were apparently larger and ſtronger, and of a dark brown or rather duſky colour. Their tails were conſiderably increaſed as delineated in the tenth figure.

On the fourteenth day of May, little difference was perceived as to their ſtructure, excepting that they were ſomething larger, and that the legs were more viſible, and jointed. The ſpine appeared of a cartilaginous white nature.

I diſſected two of the tadpoles as they are repreſented in the eleventh plate, and I found contained in their bellies, a long convoluted inteſtine, equal to about ten times the length of the body. The gut ſeem'd to be filled with an earthy matter, which they were continually excreting by an opening near the tail, I obſerved they had not much increaſed in their bulk for a day or two paſt, and that they fought and attack'd each other, which I imagined to be an indication of their wanting nouriſhment. I put ſome of the ſpawn into the glaſs with them, which they immediately ſeized on and devoured very eagerly.

The laſt change was the budding of the fore legs, and the decay of the tail, which appears as in the twelfth figure.

When the tadpoles arrived at this laſt period, I obſerved the part of the tail, which appear'd membranous, was now ſenſibly diminiſh'd and becoming continually ſhorter at laſt diſappear'd. They have now the appearance of young frogs, and differ in no viſible manner from the full grown ſpecies, but in the bulk of their bodies. See the thirteenth figure.

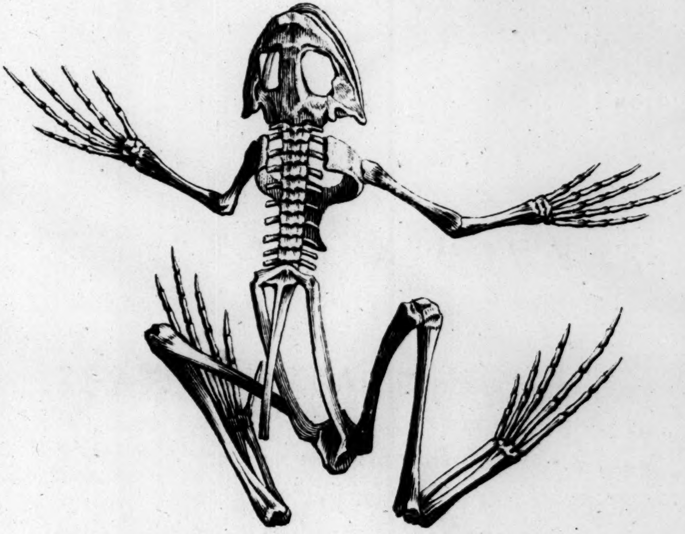
It is worth obſerving how extraordinary a change this animal undergoes in the progreſs of its exiſtence. We have hitherto ſeen it as a native of the waters, and ſurrounded by a denſe element. It ſoon changes this ſtate of an aquatic being, to breath and exiſt in a rarer medium. As it approaches to its due degree of formation, and loſes its tail, it ſearches the ſhallow borders of the brook, where for a time it lifts its head out of the water, to accuſtom the lungs to the action of the air.

The chief deſign in tracing the frog through the various metamorphoſes of its growth, was to ſhew more evidently, the organization of the material parts and rudiments of animals, from a ſimple and apparently homogene mucus. Such as we ſee it in each black molecule of the firſt figure of the ſecond plate. It was intended likewiſe, to ſhew how the ductile matter, forms itſelf into a bony hardneſs. We obſerve the traces of the ſkeleton of the frog, forming themſelves in the molecule at fig. the ſeventh, and appearing of a cartilaginous ſubſtance in fig. the fourteenth. The youthful ſtate of this animal will be found to vary in ſome ſmall degree from the adult one. This difference will appear very evident on comparing the pelvis of the young animal, in fig. 14. with the full grown one in the third plate.

It will afford matter of entertainment to the curious ſpeculator in natural hiſtory, to compare the ſkeleton of man with the adult one in this animal: the great degree of reſemblance in their ſtructure will perhaps ſtrike him, and conſidering them as parts form'd of matter in both animals, he will be ſurprized to find no very eſſential difference in their bony ſubſtance, on the niceſt chymical analyſis.

It may be neceſſary to inform the curious enquirer, if he ſhould be inclined to repeat theſe obſervations, on the expanſions of the animal molecule, not to be diſcouraged altho' they ſhould not appear ſo regular in our climate as I have found them to be in more ſouthern ones, where the influence of the ſun was greater. The expanſion of the molecule in the latter will always have a more rapid progreſs, becauſe the reaction of the ſurrounding element is leſs powerful.—The phaſes will however be conſtantly the ſame.

Plate the 3. to front Page 96



ENQUIRY

INTO THE

GENERATIVE POWERS.

INNUMERABLE phenomena have hitherto been inexplicable, according to the commonly accepted laws of generation. The cauſe of the reſemblance of children to their parents, even to a defect in their formation is unknown.—But we are to obſerve, from what has already been demonſtrated, (Firſt) That the ſeminal mucus of animals, will, from its heat and fluidity, be naturally diſpoſed, each agreeable to its ſpecifick difference, not only to receive, but retain the various impreſſions made on it by the electric matter.

Secondly. That the electric fluid, in proportion to the intenſity of its ſtimulus in the bodies of animals, muſt trace out and determine various degrees of organization, in the ſeminal fluid of each reſpective claſs. From whence it may be concluded, that the fecundation and emiſſion of the ſemen ſhould be produced not only in the ſame moment, but by the effect of the ſame mechaniſm.

To explain this matter, we ſhall tranſlate what M. de Bordeu has aſſerted, relative to the excretion of this fluid, in his book intitled, *Recherches anatomiques, ſur la poſition des Glandes & ſur leur action.*

" Firſt. It is evident that the erection of the organ, was intended to facilitate the excretion; and may be conſider'd as a neceſſary condition, without which the reſervoirs could not empty themſelves.

" Secondly. The attrition, and the ſhocks, animate the organ, they rouſe and augment the degree of erection, giving it freſh force, and exciting new convulſions, without which the erection, or ſimple ſpaſm, could not poſſibly compleat the function as it ought.

The attrition of the organ is neceſſary to excite the erection, and increaſe it. We may call theſe irritations by the name of ſhocks, (*ſecouſſes*).

" Thirdly. It will plainly appear, how much theſe preparations, and the extenſion which depends upon the erection, do promote a perfect excretion. Such conditions, if they are not neceſſary, are at leaſt uſeful.

" There is ſtill a fourth condition, in the peculiar diſpoſition of the blood veſſels. Theſe are certainly of ſome conſequence in the mechaniſm of the excretion, and we ſhould endeavour to diſcover, what alterations they undergo. In ſhort, the diſpoſition of the blood veſſels, the preparation of the excretors, the ſhocks and irritations of the organ, and its ſpaſms, are the four conditions, on which the excretion of the ſemen is founded."

Such are the circumſtances, which we conſider as the mechanical part. The next object is fecundation. The moſt active ſparks of the electric fluid, and alſo, thoſe which are moſt relative to each other, will be united together, by the moſt intimate connection.—

They are derived from the moſt active parts of the animal body, and thoſe which have the greateſt degree of ſympathy. Conſequently they ought to make a more laſting impreſſion on the ſeminal mucus. Theſe impreſſions muſt vary alſo, in proportion as the ſeveral agents are more or leſs eſſentially connected with the general ſyſtem of life.

The firſt concourſe of ſuch ſeminal ſpecies, will evidently form the rudiments of thoſe organs, on which the baſis of animal exiſtence is to be founded. They muſt diſplay thoſe principles of the animal ſtructure, which are moſt eſſential. In the ſame manner as we have already ſeen the attraction of certain particles, compoſe the rudiment of the ſpine before the formation of the inteſtinal tube.

The intenſity of the electric influence, in the male or female, or the contrary, does perhaps moſt evidently determine, to which of the two genders the fœtus ſhall belong. As alſo the reſemblance or diſſemblance of children to their parents, either as to bodily form, or mental diſpoſition, will depend in a great degree, on the various incitations produced by the ætherial principle from each individual, on the human ſemen, as it becomes fecundated. Still more from the various diſpoſitions in which each ſex find themſelves at the moment of copulation. Why are certain climates, and ſeaſons, more adapted than others to the vegetation and generation of certain plants and animals? Becauſe they excite the electric fluid in different degrees. Their influence is however much leſs ſenſibly felt on males than females. The electric fluid ſhould excite a greater degree of action in the latter, and continue it much longer, as it ought to aid the expanſion of the rudiments which are marked within the ſeminal fluid, till the being is compleatly formed by the matrix.

Is it not probably owing to the want of ſuch a due connection, and appropriation, in the generative organs of mules, that they are not capable of exciting a ſufficient degree of electric influence, to animate the rudimental mucus? Or, why ſhould they be leſs perfect as to reproduction, than other animals? The phenomena of their formation, depend on the aſſemblage of mucual principles, which are derived from a male and female of different ſpecies. This can be no objection, however, to our general argument. Becauſe, either the male or female will furniſh a ſemen from its own reſervoirs, which may ſufficiently concentrate the electric influence. Now we find there are peculiar analogies, between the mucual principles of certain animals and thoſe of vegetables. May we not then conclude, that a greater affinity ſubſiſts between the ſemen of ſome one claſs of animals preferable to others?

The faculty of reproduction is not the ſame in every ſpecies of animated beings.—In the vegetable kingdom it is generally (not always) accompliſhed by the unfolding of ſeeds and fruits, which have been previouſly fecundated by the means of flowers. The polypus, like certain vegetables, is reproduced by ſlips from the main ſtem. Certain inſects, and marine ſubſtances, riſe into exiſtence by the ſole action of the fecundating influence of the ſun.—Animals of the moſt perfect claſs have two kinds of organization, which muſt equally contribute to the reproductive powers. I mean the ſexes of male and female.

Nature furniſhes in the infant years of animals, ſcarce more than a ſufficient compliment of exiſtence: In this early period they vegitate by a life peculiar to it. The ſtomach abſorbs, as it were, the deſires of the being, and the propulſive force, renewed by the preſence of the aliment, is continually endeavouring to extend itſelf. The firſt ever attentive to collect what is neceſſary for the univerſal welfare, the latter to augment and extend the animal faculties. By ſuch mutual concurrence animals arrive at that period, in which they become endowed with the faculties of reproduction. At this age the ſuperabundant powers of life can no longer be contained within the being, but endeavour to throw themſelves externally.

The age of puberty is the ſpring time of human life, the delightful ſeaſon of our pleaſures. New inclinations, new ſenſes manifeſt themſelves, with the diſplay of thoſe organs which are to contribute to the great and neceſſary taſk of reproduction. The ſentiment or deſire by which both ſexes are led, to continue the reciprocal tradition of of their exiſtence, becomes moſt predominant. This deſire is the phyſical diſpoſition of the animal faculties. It conſiſts in what the French call, an *eretiſme* of the nervous fibres. It is produced either by the influence of the electric fire, concentrated within the human fluids, or by a greater attraction of the ætherial principle. It may perhaps be derived from the general ſympathy of the human organs, all of which ſeem to ſend off a portion of their own exiſtence, to furniſh ſome part of the univerſal cauſe. The increaſe and concourſe of the ætherial principle, are both manifeſted by a ſpontaneous inflammation, cauſing a greater degree of heat, and a more abundant afflux of the blood and vital juices towards the organs of generation. In ſhort, by a degree of fever.

The individual born away by the voluptuous tide of pleaſure, the ſenſes are ſcarce capable of his augmented exiſtence. The ætherial principle ſhoots itſelf in rapid currents from the brain to every organ, and recoils from every organ to the brain. Exciting and attracting a portion of the electric fluid from each of the nervous fibrillæ. Rouzing the languid fibres, and exciting the active ones, to the concourſe of thoſe organs, which at this time ſeem to become the only ſeat of human exiſtence. They abſorb every other animal faculty. The ætherial principle exciting the animal powers, with its utmoſt degree of intenſity; electrifies and inflames the whole nervous ſyſtem. The animal faculties are kept in ſuſpence between accumulated exiſtence, and the extinction of the being. At laſt the ſofter impulſe of venereal pleaſures, huſh the rouſed ſenſes, and calm the univerſal ſpaſm. It ſlackens the corrugated nerves and organs, whoſe tenſion ſerved as an aliment to the ætherial *volupté*.

Nature thus hurried on by the impulſe of deſire, ſenſation, irritation and ſpaſm, receives the higheſt degree of animal exiſtence. At length, overcome by the ſhock, every animal function is diſturbed. Thus from the pleaſing heights of fancy and ſenſation, ſhe ſinks into a ſtate of calm and perfect ſatisfaction.

From this phœnix-like exiſtence, nature kindled the aſhes for the new-born being. For we obſerve, in ſuch moments, the animal heat in the body is increaſed. The ſenſes have all been ſhock'd, and the ſpaſms of the male and female, have been univerſal. If then we conſider the extreme ſenſibility, and the various ramification of the nerves, which ſpread themſelves upon the matrix, and the facility with which this part is thrown into ſpaſms, may we not ſuppoſe, that the center of female exiſtence has been fixed on this point, for a moment?

" The property, ſays M. la Caze,* which " the organs deſtined for the ſecretion of " the ſeminal fluid have, to become, at the " moment of the excretion of this matter, " the center of all movement and ſenſibility " in the human body, is too conſiderable a " phenomenon, to limit the conſequence to " the mere excretion. The electric fluid " cannot be otherwiſe conſider'd than as an " active atmoſphere which ſurrounds and " incloſes not only the exterior, but alſo the " interior parts in the body of every animal. " From hence it will not be difficult to conceive how the electric fluid ought, from " that general revolution which happens at " the very inſtant of emiſſion, to throw itſelf from every part of the body towards " the organs of generation, and to imprint

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* Idèe de l' Homme, Phyſique et Moral.

“ itſelf in the ſeminal fluid, nearly in the
“ ſame manner as the rays of light reflected
“ from an object, paints the icon of it on
“ the retina.”

I muſt beg leave to diſſent from this celebrated author in ſome reſpects, relative to his opinion on the action of the electric fluid, in the ſeminal mucus. Becauſe I ſhall prove in another work, that it is a matter of doubt, whether the rays of light do paint any icon on the retina.

Without entering, therefore, into any arguments on that ſubject, I ſhall only obſerve the effect produced by the electric fluid, on the mucual parts of animals, when they are conſtrained to undergo a change in their modification. Such for example, when putrefaction ſeizes the humors, and fleſhy parts of animals. We obſerve previous to this change, that the portion of the electric fluid, which is ſtill concentrated (within the now inactive body) collects itſelf together to renew ſuch a ſufficient degree of the elementary and ætherial principles, as to give birth to that multitude of atoms and grubs, which we obſerve to ſpring from the diſſolution of

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the once animated mucus. Juſt before this change happens, the mucual matter appears all over luminous, like the tail of the glow-worm or the ſhining of the ſea water at night.

We have ſtill another proof of the poſſibility of the electric fluid concentrating itſelf within the animated mucus, by what we obſerve in that ſpecies of zoophytes, which mariners call the *ſting-cup*. This Being, when taken out of the ſea, is a round tranſparent globule of limpid mucus, without any perceptible degree of organization, but ſo full of the electric fluid, that if it meets with bodies leſs electric than itſelf, it ſhocks them very ſeverely. The impulſe may be felt in a very ſenſible manner if this mucus is ſuffer'd to remain in the palm of the hand for a ſhort time.

Since it appears ſo evident to our obſervation, that the mucus of ſome beings is much more ſuſceptible of the electric influence than others, it may be preſumed likewiſe, that the moſt active organs of the human body, will be thoſe which poſſeſs the electric matter in the greateſt abundance. If this be allowed, we muſt neceſſarily conclude, that they excite a greater impulſe in the ſeminal fluids than thoſe organs which are leſs active.

Hervey, Malphigius, Bellini and Valiſnieri, obſerved that the ſpine and the head, were the parts of the chicken which firſt preſented themſelves. M. la Caze ſuppoſes, likewiſe, that as the brain and medulla oblongata, are formed in a ſimilar manner in the male and female, and conſider'd as the principal centers of action in the body, they ought of courſe to make the ſtrongeſt impreſſions in the ſeminal mucus. Theſe opinions correſpond with the formation of the ſpine and the bones of the cranium, which was obſerved in the expanſion of the animal molecule.

The radiations of the electric matter being (as we have already obſerved) directed by the force of the impulſion, ought to throw themſelves to different centers. From each of which centers the electric fluid, according to the general phenomena of attraction or repulſion, ſhould collect or diſperſe certain parts of the conſtitutive mucus, and form by degrees, that ſucceſſive expanſion of organs, which is to compleat the phyſical life of animated beings. This expanſion is what we ſhall next proceed to inveſtigate. We ſhall endeavor to ſhew how the material parts of Beings become organized, and acquire certain modifications to form an animal, endowed with motion and perceptions.

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EXPANSION and GROWTH

OF THE

EMBRIO,

CONSIDERED.

THE better to comprehend the expanſion and growth of the embrio, let us call to mind what has already been ſaid on the ſubject of the primitive molecule in animated beings. We obſerved this firſt rudimental principle of the nervous ſyſtem, to poſſeſs both ſenſibility and motion. It was conſider'd as containing within itſelf the parts of the whole, or rather the compendium of the animal. It ſwam in a mucual fluid, or in a matter in no way differing from that of its compoſition, but by its fluidity.

If we may believe the obſervations which have ſucceſſively been made, from the time of Hippocrates to the moderns, as Mr. Haller's, M. de Buffon's, &c. it will appear that the primitive molecule is gently agitated by the exerciſe of that life which it is found to enjoy. It expands and augments its volume, by the action of the propulſive force, or the ætherial principle, contained within it; ſo that in a ſhort time we perceive the ſketch of the medulla oblongata and the ſpine. Near the top of the laſt a ſmall bend is to be diſtinguiſhed, which ſoon after appears in the form of two curves or parabola, which expand and dilate themſelves alternately. Theſe motions are the firſt indications of vitality in the primitive molecule. Beſides all this, we ſhould obſerve the diviſion in the ſuperior part of the curve of the nervous cylinder, reaching into the inferior extremity, which is mark'd by a line continued through the whole length. Within the ſpace form'd by the dilatation of the two parabolic branches certain veſicles, protuberances, or black points may be perceived, which are found to be the rudi-

Plate the 4. to front Page 113.

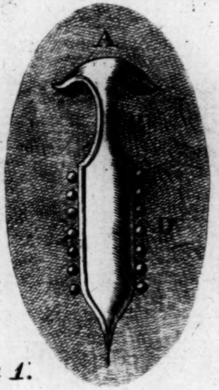

Fig 1.

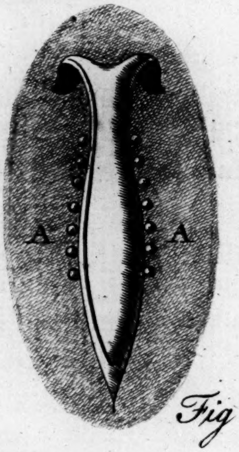

Fig 2.

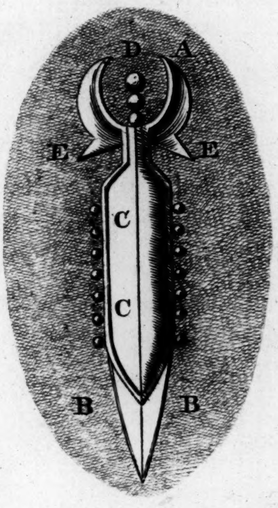

Fig 3.

rudiments of the brain, and organs of the ſenſes. See fig. 1, 2, and 3, of the fourth plate.*

About this time the medulla oblongata and ſpinalis are conſiderably lengthened, and cover'd by a mucual matter, a few ſmall excreſcenſces are to be ſeen, which form the

firſt

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* *Haller.* A. 31. Heures et demi, la tête du fetus paroit fendue, et repliée comme dans la figure 8. et 9. de l appendix de Malphigi.—Fig. 2. Pl. 4.

Malphigius ſpeaks as follows. In ovis itaque minùs vegetis et infirmioribus *carina* taliter apparebat: geminæ zonæ, ſeu craſſæ candidæque lineæ A. in capite parum diſtantes et quaſi reflexæ in poſticam partem B. iterum approximatæ, in longum protraſtræ, carinatum ſpatium efficiebant, et hinc inde vertebrarum ſacculos numero ſeptem D. appenſos ſervabant, iterum tandem coeuntes, carinæ extremum conſtituebant. Quid ſimile miratus ſum poſt diem integrum incubatûs, dum zonæ A. parum obliquatæ, carinam conſtitúebant.—Fig. 1. Pl. 4.

Haller. Section 5. A. 40 Houres, la tête imite aſſez bien unc *treſle* dont la diviſion n éſt pas bien profonde.

Hervey. Exercitatio 18. Die ſexto, capitis tres bullæ evidentiùs apparent, occulorumque tunicæ jam diſtinctæ ſunt: ſiuıul etiam pedes, atque alœ expufirſt ſhetches of the vertebræ. This column is call'd by Malphigius, &c. the carina of the chicken. Now the nervous cylinder ſhoots forth buds, which are to form various branches for the different organs.—Theſe buds or vegetations from the nervous cylinder, are in every reſpect ſimilar to the general branch or ſtalk, and endowed with the ſame faculties of ſenſibility and motion. As

lulant: quemadmodum, ſubfinem Junii, gyrinis (Italis *ranabottoli* dicuntur, Anglis *tadpoles*) pedes ad naſci ſolent, cum jam aquas deſerunt, caudam amittunt, & ranulæ formam induunt. Circa hoc tempus etiam viſcera omnia & inteſtina conſpicua ſunt. Cor verò ante reliqua ſe videndum exhibet: pulmones etiam ante Jecur, aut Cerebrum.

Malph. Enim familiare ipſi Naturæ ſæpiùs obſervavi, in zonis motum adeſſe, ita ut ſuo acceſſu & receſſu aréæ et ſinus excitarentur et tollerentur.

E. labente die ſæpius ſpecies hœc occurrebat, quâ capitis tumor A. emergebat, et diductis in dorſo zonis B. carinæ concavitas efformabatur, quæ ſpinali medullæ C. locum præbebat, cui veſiculæ cerebi D. appendebantur; colli, capitis, & alarum E. productiones magis manifeſtabantur.—Fig. 3. Pl. 4.

Haller. Section 5. Vol. 2. A. 70 Heures les premieres ebauches des ailes commencerent a paroiter & quelquefois même celles des Jambes.

As they extend, they ſelect ſuch of the molecules of the mucual fluid, in which they ſwim, as are moſt analogous with their proper ſenſibility, or their reſpective taſtes.

By the application and coalition of molecules of the mucual fluid to the nervous cylinder and its branches, an augmentation is cauſed in their volume. But we are to obſerve, that this increaſe muſt of neceſſity follow the primitive deſign, which has been imprinted on the atom of the being by the hand of the Creator. Without this divine energy, the whole would be a rude and undigeſted maſs. The myſteries of the growth and expanſion of the different powers of the embrio, are deſtined to follow ſuch laws as have been appointed for the general welfare. They appear to operate this expanſion, by an evolution and epigenneſin, or by a proſphyſis or coalition of parts of the mucual fluid, according to the archetype of the animal atom.

The evolutions of the embrio reſemble the expanſion of flowers. The phenomenon of epigenneſin may be compared to the vegetable fibre in the madrepora, and other marine plants, which encruſtrate themſelves with an earthy ſubſtance. To proceed in our enquiries:——

When the nervous cylinder has ſent off certain protuberances from its ſuperior parts, it ſeems to bifurcate in order to form a covering to ſecure the brain and organs of the ſenſes. It lengthens itſelf likewiſe to complete the carina. At this time the ſmall threads may be ſeen which M. de Buffon has call'd *aire ombilicale*, and are deſtined to form the umbilical veſſels. After the completion of theſe firſt phenomena, the embrio ſeems to be ſurrounded by a vaſcular zone, in which a fluid may be ſeen to move, although the veſſels are of an inconceivable ſmallneſs. This fluid loſing its tranſparency, reddens, and at laſt becomes blood.—At this time one of the buds, ſhooting forth from the nervous cylinder, prolongs itſelf and forms a bulb, which contains the rudiment of the heart. By degrees it increaſes till it manifeſts itſelf to the ſenſes, under the form of an unequal tube, having two bulbs at its extremity, which appear afterwards to be the *ventriculi*, and *auriculæ* of the heart.

The nervous bulb, which is deſtined to form the heart, does not appear alone, for it is accompanied by ſeveral other branches or ſprouts from the nervous cylinder. They ſhoot themſelves in various manners round the bulb, and appear in time to form the nervous foldings of the precordial or epigaſtric region.

We have ſeen the carina or medulla oblongata, the head and the heart, or the whole precordial region, comprehending the epigaſtric, form, as it were, the three firſt vegetations from the nervous cylinder or cicatricula. But we are not to forget, that the primitive molecule, or the animal atom, has conſtantly been the one general center, from which every other part has been deſcribed, and will continue the neceſſary agent of every future change, in the formation of the embrio. It will be eſſential to remark, with M. de Buffon, that the blood was found to ſhew itſelf before the complete expanſion of the heart: a circumſtance which has already been mentioned in the beginning of the work.

From each ſide of the carina, and through its whole length ſeveral white nervous threads may be perceived, which become curvated, and form the ſides of the breaſt or ribs. Above and below theſe laſt vegetations from the ſides of the carina, and always in the ſame degree of ſymmetry, appear four leſs conſiderable productions. Theſe new nervous ſhoots are deſtined to form the upper and lower extremeties.

The ſymmetry and order which we have obſerved in the nervous vegetation, will become more intereſting, if we conſider that general line which divided the nervous cylinder into two equal parts, as the common axis to this peculiar order and connexion. It is repreſented in the third figure of the fourth plate, and has already been mentioned in the expanſion of the molecule, and ſhewn in the ſixth figure of the ſecond plate. This diviſion will be farther conſider'd as it falls in the courſe of our enquiry, and it will be ſhewn that it is of the greateſt conſequence in the animal œconomy. Beſides, theſe vegetative phenomena of parts, ſuch as the wings and legs of the chicken, the ribs, &c. and the univerſal line within the carina, may authorize us to conſider the animal as divided into two equal portions, which are laterally united to the center or middle of the being, as to a common axis.

We mentioned once already, that the nervous cylinder diſplayed certain eminences or aſperities, which we afterwards found to be the rudiments of different organs: or, in fact, they ſeem'd to be deſtined to form and animate them. The heart was obſerved to ſhoot out from one of theſe bulbs, and we ſhall find it to be the ſame with the liver, ſpleen, and lungs. Theſe viſcera are formed by nervous buds, emaning from the common cylinder, which appropriate to themſelves certain molecules of the mucual fluid in which they ſwim. Each viſcus forms a peculiar domicil, with different layers of it.—So does the action of the nervous ſprouts upon the mucual matter form it into certain cells or ſatchels, which have either more or leſs laxity, poroſity, or denſity, relative to the uſes to which each viſcus is deſtined.—Obſerve the peculiar ſpongineſs of the lungs. In this viſcus the mucus is blown, as it were, like glaſs, into various cells. It is nearly the ſame with the mucus which ſurrounds the nervous bulb that forms the organical eſſence of the ſpleen, liver, &c.

We find, however, that its organization is much more groſs and leſs perfect in the principal viſcera, than it is in the compoſition of the nerves themſelves. This ſubordinate organization forms only what old anatomiſts call'd the parenchymous parts of bodies, and appears to be intirely different from the purer mucus of the nerves. We ſhall find this matter varying in the compoſition of the ſeveral organs. It is finer and much more exquiſite in the brain than in the liver, the lungs, or ſpleen. It differs likewiſe in quality and denſity in the muſcles, the glands, and bones, as in the laſt it is peculiarly combined with an earthy ſubſtance.

It will be very important to remark at preſent, the biformed ſtructure of the viſcera, which we have juſt mentioned. To conſider each of them as divided into two equal parts, whoſe points of diviſion are united into one common axis, which M. de Bordeu, a French author, calls *raphè generale*. This diviſion of the animal body into two equal parts has already been conſider'd by Hippocrates, ſo has it in ſome of the antient works of the Chineſe. It has been examined with more induſtry by ſome modern French authors, as Meſſrs. de Bordeu and la Caze. Ariſtotle, the copier and echo of Hippocrates, extended the ſyſtem of this diviſion to the viſcera in general. Experimental obſervation has confirmed his ſentiments. This univerſal *raphè* may be traced all along the inteſtinal canal, particularly ſo, where it is united to the meſentery, It may be ſeen very plainly on the larynx, pharynx, œſophagus and matrix, likewiſe in the brain and lungs. The ſagittal ſuture, the vomer, the diviſion of the bones of the palate, and lower jaw in the fœtus, the linea alba of the abdomen, the ſymphyſis of the os pubis. According to the remarks of the ancients, the veins even have been ſubmitted to the ſymmetry of this diviſion, which they have diſtinguiſhed by the word catixin, &c. Obſerve how the uterus in moſt animals is divided into two equal cavities. Baillou, the great contemplator of nature, conſider'd the matrix* in women as double.

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* Fieri autem poteſt ut in tacti ſiniſtris (venis) dextræ laborent, *uterus* enim geminus eſt.

BAILLOU.

As we continue to examine the phenomena of the expanſion of the embrio, we find that the glands are chiefly form'd by a ſmall plexus, or nervous bulb, which covers and encruſtates itſelf more or leſs with different layers of the mucual fluid.—The muſcles ſeem equally to reſult from certain points of the nervous cylinder, which clog themſelves with mucus, and form it afterwards into cells of a denſe ſubſtance. Theſe cells are ſoon fill'd with blood veſſels. The mucual bark or cellulary ſubſtance of the muſcle, thus penetrated with ſmall veſſels, form what the ancients call *tomentum ſanguineum*, and what they thought compoſed the ſubſtance of muſcles themſelves.—The reader will call to mind what was mentioned in the beginning of this treatiſe, that the eſſence or animal part of muſcles, conſtituting thoſe organs and giving them their motive powers, was either the nerves themſelves, enriched with the ætherial principle, or ſprouts only from the nervous cylinder, animated by the electric fluid. When a muſcle has been macerated for ſome time in water, it will loſe the greateſt part of its component mucus; what remains will be found to reſemble white threads, which are the nervous fibres. Or expoſe part of a *muſcle that has been macerated in water to the freezing air, and you will ſee by the ice in the cells, how irregular and unequal they are, and their communication with each other. The tendons, like the muſcles, are evidently formed by the influence of certain nervous fibrillæ and a more compact and denſe mucual matter. So are the ligaments and cartilages, but theſe laſt demand a firmer and more cryſtalline mucus. The bones ſeem to preſent us with nearly the ſame phenomenon in their formation. Their rudiments were obſerved to reſemble threads of mucual matter of the moſt ſurpriſing tenuity. Malphigius diſcovered the firſt ſketches of the ribs, appearing in ſmall bulbs, emaning from the nervous cylinder as I have repreſented them in the fourth plate. The mucus of the bones is however much more groſs than that of every other part of the body, and mixed with an earthy or calcareous principle. It has likewiſe a greater propenſity to concrete or become ſolid, independent of the preſſure of the ſurrounding parts.

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* Recherches ſur le tiſſu muqueux, ou l'organe cellulaire, par Theophile de Bordeu.

As to membranes, ſome are intirely compoſed of ſimple mucus, as the pleura, peritonœum, the pia-mater, &c. but what is moſt remarkable, that they not only communicate, but are, as it were, intimately connected with each other.—The pleura manifeſtly communicates with the peritonœum, through the different openings of the diaphragm: they both ſend out ſeveral ſmall filaments which penetrate the ſubſtance of this muſcle, and are mutually blended together. The pia-mater is known to be connected with almoſt every part of the human body: it accompanies the nerves with which each organ is ſurrounded. This membrane protrudes itſelf through the foramina lacera, upon the maxilla ſuperior, where it unites with the pituitary membrane, and is continued within the roof of the mouth to the throat. The pia-mater is connected likewiſe with the pleura, which laſt ſeems to meet it in its exit with the large veſſels from the cheſt to the internal part of the neck.

What we are chiefly to remark with regard to the nature of the membranes, are their peculiar folds, in which ſeveral viſcera are ſo artfully incloſed, that the interior ſurface of theſe membranes ſeem to degenerate into a kind of mucual pulp, fill'd with ſmall apertures or cells, which conſtitute the parenchymous parts, or the volumes of the viſcera. The ſame thing is to be obſerved on the ſurface of the interior ſkin of fruits. They appear to have a kind of mucual efflor-eſſence, which loſes itſelf in the parenchymous pulp of the fruit. So alſo does the placenta, ſeem to be form'd of the amnios. The membranous veſicles of the brain, which ſhew themſelves ſo early in the expanſion of the embrio, appear to be nothing more than a continuation of the pia-mater, and may be compared to an exterior membrane, in which a mucual pulp, by its increaſe, is obſerved to fill up and expand the cavity. Splanchnological obſervations ſeem to confirm our conjectures on the folds of membranes and their uſes.

Beſides theſe already mentioned, there is ſtill another claſs of membranes, which may be call'd, on account of their ſtructure, nerveo-muſculoſo, becauſe they ſeem to be rather nervous than muſcular in their nature. Among theſe laſt we place ſuch as the dura-mater, perioſteum, ſkin, &c. Each of them ſeem rather to form a nervous web, more or leſs abounding in fleſhy or muſcular fibres.

The diaphragm ought to have the firſt place among the parts of the animal compoſition call'd nerveo-muſculoſo. It reſembles a nervous denſe membrane, ſtrengthened in the greateſt part of its two ſurfaces, by a ſtratum of muſcular fibres. If properly conſider'd, it is not only the moſt wonderful, but the moſt eſſentially concerned in every important function of the animal œconomy. It has been ſhamefully neglected by our modern authors, who have only conſider'd it as anatomiſts and mathematicians, without deriving thoſe advantages which the philoſophical ſpeculator ſhould do from its ſtructure. They have neglected the enquiries which the celebrated Hippocrates ſo much recommends, and which have been imitated by our ingenious Sir Kenelm Digby. The firſt ſuſpected it to have an influence over certain paſſions of the mind, as joy and anger, and the laſt endeavor'd to confirm the ſuppoſition.

Before I leave the ſubject of membranes, I ſhall obſerve once more, that they do all mutually communicate with each other, from one part of the body to another, and that, by the aid of the whole organ call'd the cellulary web, or membrane.

The ſame diviſion as a principal of organization may be obſerved in the winding canal, call'd the inteſtinal tube, which extends from the mouth to the other part of the body. Its ſtructure reſembles that of the membranes which participate of the twofold nature of nerve and muſcle. It ſeems to be a kind of hollow cylinder, enriched with ſeveral ſprouts from the primitive nervous fibre, which gives it ſuch exquiſite ſenſibility and motion, as to have the moſt extended influence in the animal œconomy. This appears evident, when we conſider that the œſophagus, ſtomach, and inteſtines, are deſtined to form the principal functions of animals.

The nails or claws of beaſts are compoſed of a ſubordinate mucus, and looſe their ſenſibility by a continual preſſure, which render the cellulary membranes of theſe parts of a corneous ſubſtance. The epidermis, hair, hide, wool, or feathers, are alſo form'd from a mucus, without the nervous ſubſtance, making part of their compoſition. At moſt they only appear to be actuated in their origin by certain nervous fibrillæ, as the authors of all organization in animal bodies, and are only ſimple vegetations of the mucual ſubſtance: *M. le Camus is of the ſame opinion. —It is a matter, however, which yet remains to be determined, why nature has placed hair on certain parts of the body in preference to others?

Perhaps it is by ſome organization nearly analogous to the tranſmigration of the animal mucus already mentioned, that we ſometimes find hairs, grubs, &c. form themſelves ſpontaneouſly in buboes. This circumſtance will not, however, contradict the general dogma on the formation of animals. Becauſe the *ætherial principle* animating and organizing their mucus, follows the general arche-type, imprinted on the animal atom by the Great Creator.—In this deſign, the nerve appears as the catholic agent in the hand of the Almighty.

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* Les cheveux forment les fibres ſemblables aux-petites racines qúon nomme le chevelu des bulbes. ——L'Homme marche et netient pas a la terre, ainſi queles plantes. Il eſt implantè dans l'air, et c'eſt del'air qûil doit tirer une partie de ſa nourriture. Les cheveux et les poils tirent peut-être de l'air une portion d'electricitè, ou du feu electrique nèceſſaire pour entretenir la chaleur animale. Les cheveux et les poils ſont des points propres a tirer le feu electrique.—Anatomie nouvelle, p. 51. de la Medicine pratique.

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Remarks on the *Cellulary Membrane* of *Animals*.

THIS organ, or pſeudo-organ, is known by phyſicians and anatomiſts under the common name of cellulary membrane. The phiſiologiſts ſeem to have neglected all enquiries into its ſtructure or uſes; they left that object to the care of anatomiſts. Theſe laſt ſeem to have conſider'd that ſmall portion of it only, which they found between every interſtice of the muſcles. Some of the French anatomiſts, as Meſſrs. Winſlow and Ferrein, pretend not only to have known, but deſcribed it in its integral parts, by the term *tiſſu-cotoneux*. We ought not to refuſe them the honor of the diſcovery, but it appears as if Hippocrates and the ancients had remark'd ſomething ſimilar, by their deſcriptions of ſpongiform texture and poroſity of the body.

Democritus, Leucippus, Lucretius, and the whole ſect of atomical philoſophers, were of the ſame opinion as to the poroſity of animal bodies; but it was the father of phyſic, the venerable Hippocrates, that added to, and moſt embelliſhed this ſyſtem, by the penetrating and juſt obſervations he made on the human body, in the ſtate of health and ſickneſs.—*Totum corpus eſt cribroſum*, ſays the ſage philoſopher.

Moſt of the ancients ſince Galen, ſeem equally to have known the porous and cribble form ſtructure of animals. For what can mean the *lames perſpirabiles*, the *parvos meatos*, which ſo often occur in their works; or the humors, which are ſometimes contained within, ſometimes without the veins; (extra venas) or in thoſe different cavities which ſeveral ancient authors have called the third region of the body. Lera de Fuentes, an excellent Spaniſh writer, tho' but little known, has greatly improved upon this ſubject in his theory on the action of iſſues and their uſes.

Now it is evident, that the humors of the body, which are extra venas, and not within the cavities, muſt manifeſtly be contained within the cellulary membrane.*

I mentioned before, that the ancients knew the intermediate ſubſtance between the extremity of the veins and the cavities; ſo likewiſe have the ancient moderns, ſuch as Proſper Alpinus, Zacutus Luſitanus, Valleſius, Baillou, &c. been of the ſame opinion. Is it not, however, ſomething very ſurpriſing, that ſo palpable a fact, and ſo clearly demonſtrated by the founder of the medical art, ſhould have been ſo much neglected, as ſcarce to be underſtood, when M. de Bordeu firſt undertook to prove, in a work intituled *Recherches ſur le Tiſſu Muqueux ou L'organe cellulaire*, printed at Paris in the year 1767, the exiſtence of ſuch an organ as the cellulary membrane. Dr. Monro ſeems to have known its texture, if we may judge from what he mentions in his eſſay on the dropſy.

Mr.

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* Verduc, in his firſt Vol. P. 110. denies the anaſtomoſis of the arteries with the veins, and ſays the blood throws itſelf in the ſpongy texture (tiſſu cellulaire) of the parts.

Mr. Haller has ſpoke of it likewiſe in his great phiſiology; ſo have Meſſrs. Thierry, La Caze, Michel, Robert, &c. at Paris, and Dr. Fouquet at Montpellier. Meſſrs. Monro and Haller have conſider'd the ſubject as anatomiſts, while M. de Bordeu has treated it in a more extenſive manner.

Beſides the properties of this organ already mentioned, it is here we muſt fix the true ſeat of all inflammations or ſuppurations, and the way by which the matter of every metaſtaſis is conveyed. It is in the cellulary membrane alone in which are to be found the ſeat of moſt diſorders, and the cauſes of almoſt every phenomenon affecting the animal œconomy. In a word, its ſtructure and connections are the moſt important ſtudies for every practitioner in phyſic.

When examined by the microſcope, it ſeems to be a congeries of atoms, or corpuſcules, connected together, without any appearance of regular ſymmetry: its denſity is often different from various cauſes. M. de Bordeu compares it to jelly form'd from meat, or to the mucual ſubſtance of vegetables,

bles, and calls it, from its reſemblance, the *mucual tiſſue.

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Formation of the *Veins* and *Arteries* of *Animals*.

THE leaſt anatomical inſpection will afford ſufficient evidence to convince us, that the canals of animal bodies, which diſtribute the fluids to different parts, are form'd by the ſame matter as the cellulary membrane, and animated by nervous fibrillæ.

The various fluids in the embrio, and particularly the blood, ſeem to force their paſſage through the colliquamentum, to purſue the active impulſe of the electric matter. If this aſſertion cannot be clearly proved to ocular demonſtration, yet it ought not to be intirely rejected. The moſt probable conjectures we can give on this matter are, that the various modifications of the mucus muſt collect different quantities of the electric fluid, and form certain points or active centers, whoſe force will be in proportion to their conſtituent parts. This will appear conformable to the general plan, as theſe centers, from their electric influence, will either attract or repel the fluids of the embrio with more or leſs violence. The heart, for example, when once form'd, or only ſketch'd out by thoſe nervous ſhoots which compoſe its bulb, and the veſſels of the precordial region, will become ſome of the moſt active centers in the embrio, and attract or repel the fluids which ſurround them. The action of theſe centers upon the fluids of the embrio, can only be ſuppoſed to determine their torrents towards them, by a mechanical impulſe. Becauſe the formation of the blood is produced by a fermentation or putrefaction, in conſequence of an increaſed degree of heat. The blood is form'd, and alſo, detached from the body of the animal, as M. de Buffon aſſerts; but not by the action of the heart as mentioned by Dr. Monro in the medical eſſays. Experience has indeed clearly ſhewn to us, that the red globules are formed in the yolk of the egg before the heart, from fermentation, ſince before it becomes of a perfect red colour, it goes through ſeveral gradations of ſhades.

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* Tiſſu Muqueux.

It may therefore be preſumed, that the different veſſels ſhoot towards the heart; at leaſt it ſeems probable as if the nervous bulb, which compoſed its eſſence, gave it a great degree of activity, by which it drew towards its own center, the current of the ſurrounding fluids. For as they run along the mucual matter, they form themſelves canals within its ſubſtance. Even the ſmalleſt degree of preſſure on it, will cauſe a greater degree of denſity, by promoting its concretion.

The arterial ſyſtem may be compared to a cone, whoſe baſe is in the arterial extremities, or the circumference of the body, and whoſe point is the heart: or it repreſents the roots of plants, which diminiſh in quantity and increaſe in diameter as they approach the precordial region.

The ancients conſider'd the liver as the ſource from whence the veins drew the blood. They obſerved the umbilical vein of the fœtus running immediately to the liver, and the great veſſels of the vena cava and porta taking their exit from this organ.

The *Nutrition* of *Animals*.

THE cellulary membrane has one very remarkable property, which is, to be the immediate agent in nutrition. The folds or molecules of its texture are continually repaired by the various fluids which circulate within its ſubſtance. The nutrition of animals appears to be a ſlight orgaſmus in the part which is to be reſtored as the application of the mucual fluid to the fibres, is one great cauſe of their growth. The nutritive juices adhere to and varniſh over the different nervous fibrillæ, and replace the mucus which is inceſſantly impaired by the exerciſe and motion of the animal. For, as the greateſt part of the animal ſtructure is founded on the cellulary membrane, this organ ought to contribute to nutrition in the adult, as in the embrio ſtate.

I have long imagined, and am well aſſured by a phyſical gentleman who is a great ornament to his profeſſion, that the cellulary membrane, when conſider'd as to its ſpongy texture, always received a portion of the circumambient air into its ſtructure. He meaſured the circumference of his head and trunk every day for a year, and found that the ſouth winds and a humid atmoſphere conſiderably increaſed them; whereas on the contrary a dry north-eaſterly wind diminiſhed their ſize. Several experiments were likewiſe tried to prove the univerſal communication of the cellulary membrane through all parts of the body. A ſmall inciſion was made in the thighs of two dogs. Into one the air was blown, and water injected into the other; the firſt had a kind of emphyſematous ſwelling all over the body, and the latter became dropſical. The air and water were found, likewiſe, to have penetrated as far as the epiploon. An inciſion was alſo made in the thigh of a rabit, through which a pint or more of ſkim milk was daily injected, and the animal was preſerv'd alive for ſome conſiderable time without any other ſuſtenance.

We have hitherto conſidered the principal circumſtances in the expanſion and formation of the embrio, or at leaſt we have ſelected ſuch phenomena as might afford us the moſt philoſophical views relative to the ſtructure of animals. It now remains to give a few general ſtrictures on what has already been advanced.

If the formation and expanſion of the embrio are form'd from the nervous cylinder, which was call'd the primitive molecule, it will follow that this cylinder is the carina of every animal, or their firſt fibre. If therefore, by an abſtraction of ideas, you ſeparate the animal body from its mucual tiſſue (tiſſu muqueux) or that mucual ſubſtance which has been demonſtrated to vary in denſity and ſolidity, the whole will be reduced to a nervous ſkeleton, or in other terms, to a kind of neurology of animals. From whence it may be concluded, that animals are eſſentially compoſed of a nervous vegitation which extends and pleaſes itſelf in the mucual fluid, as directed by the impulſes of the ætherial principle.

This nervous cylinder is then the element of animals which is to vegetate and extend itſelf as it is directed by the electric agent, after the atomical characters have been fixed on them by the divine impulſe. As therefore by animal atoms we expreſs a ſpecies of elements,

ments, which cannot vary in either the different claſſes of Beings, or in the individuals of theſe ſpecies (for the human mind can conceive nothing beyond the ſtate of an atom) we may conclude that the animal atoms are the ſame in every kind, as to their principal qualities of bulk or figure.

If, as we have obſerved, the phyſical qualities of atoms are univerſally the ſame in every part of nature, when beyond the comprehenſion of our ideas, ſo their variation muſt depend on their organization, or perhaps the quantity of animating eſſence which is deſtined to each in particular. It is evident that peculiar diſpoſitions characterize the various cryſtallizations of certain ſalts, and the various texture in the leaves of vegetables. Why then may we not ſuppoſe that the fibres are the ſame, as the number of organs do always univerſally correſpond in animals which are perfectly formed? Now as the primitive fibres are ſuppoſed to enjoy the ſame character in the whole animal kingdom, the difference will ariſe from the number of buds ſprouting from the nervous cylinder, or from certain conſtitutive principles in that univerſal agent, the mucus. It cannot be too often repeated, that the primitive and eſſential characters of the fibres in animals is every where the ſame. So are they in vegetables. Each being conſider'd as to their primitive ſtate, have the ſame analogy in their component ſubſtance, the mucus, which we have endeavor'd to prove was the conſtituent matter of every animated part of nature.

If, therefore, the integral parts of any elementary body whatever are perfectly ſimilar, ſo is the fibre of one individual equal to the fibre of another individual of the ſame kind.

Before we conclude, it may not be improper to mention that viſible affinity which may be obſerved between the mucus of certain vegetables, and the production of peculiar ſpecies of animated ſubſtances. The moſt conſpicuous of this claſs appears in the connection between the mucus of the mulberry leaf and the ſilk worm. Caterpillars are almoſt continually to be found upon the ſame ſpecies of leaves. The filberd produces conſtantly the ſame kind of grub, and it is more than probable, that the various claſſes of moving beings are connected with and depend upon the mucus of different vegetables.

I have not yet been able to convince myſelf of the truth of this aſſertion, but I had ſome reaſon to think that animals may be produced from vegetables, by a progreſſive vegetation. I found a plant growing from a root,* and increaſing and extending its branches from the ordinary principles of vegetation, at length came the bulb which ſeem'd to contain the fruit of the plant, but on opening it, the whole appear'd to be occupied by an animal ſubſtance, through whoſe texture various blood veſſels were ſeen to convey a red fluid. In this caſe the plant vegetates by the various rules with which they are governed, but its ſeed as an animal ſubſtance proves that a vegetable form may produce a being far ſuperior to itſelf. So according to the uſual courſe of nature, this animal could never have exiſtence but by the prior vegetation of the plant.

Such circumſtances are evidently oppoſed to the doctrine of the ſchools, and deſtroy indeed the very baſis on which they are founded; but as the firſt are ſupported by nature, they will evidently exceed them in duration. Several French authors have already obſerved, that the ſcholaſtic doctrines were haſtening apace towards their overthrow.

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* This plant was found at Brighthelmſtone, growing on a ſtone, on the ſea ſhore.

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PECULIAR QUALITIES

OF THE

CELLULARY MEMBRANE.

IF we call to mind thoſe qualities which we obſerved in the animal mucus, we may eaſily perceive how apt the cellulary membrane muſt be to undergo various phyſical alterations. We obſerved the mucus to be exceeding prone to concrete if expoſed to the air, and to become much harder in a dry atmoſphere than in a denſe one. According, therefore, to different climates, or as the northerly or ſoutherly wind predominate, the cellulary membrane of animals will be influenced by the elementary principle, that is to ſay, it will have more or leſs ſpring. The different threads of this membrane will be more or leſs ſtrung, or the cellulary ſubſtance variouſly dilated or cloſed. From which circumſtance it ſhould evidently follow, that the veſſels and nervous fibrillæ, which are diſtributed within the cellulary ſubſtance or parenchyma, muſt find more or leſs reſiſtance to their natural oſcillations and action. A variety of modes of exiſtence and ſenſations in animals muſt be occaſioned by ſuch alteration. It is, perhaps, from a cauſe nearly ſimilar to this, that we find ſuch eſſential difference in animals which live under the ſeveral degrees of climate from the Equator to the Poles. It is this elaſticity or denſity and firmneſs of the cellulary ſubſtance in general, joined to the ſenſitive faculty of the ſkin, when conſider'd as a nervous veil covering the whole body, that promotes what Van Helmont and Sthaal call'd tonick movements, and which ſeveral phiſiologiſts have ſince found to influence over the chiefeſt part of the functions of the animal œconomy.

Before we proceed any farther it will be neceſſary to remark, that, as theſe alterations in the elementary principle are found to influence very much upon the cellulary ſubſtance, ſo does this laſt, in its turn, influence over the whole nervous ſyſtem. It muſt alſo appear how vague the terms are, of bracing and relaxing the nerves, and the ridiculous compariſon made with them and the ſtrings of muſical inſtruments, which, becauſe we find the laſt affected by the various changes in the ſtate of the atmoſphere, we imagine the nerves of animal bodies to undergo the ſame alterations. But ſurely theſe changes in inanimated ſubſtances muſt be far different and inferior to the ſenſibility of the nerves, which are never expoſed ſo much to the air, but are conſtantly moiſtened by the various fluids of the body. Beſides, every nerve is cover'd over, and modified by the cellulary membrane, and ſecured by it from the immediate action of the elementary principle.

The phyſical diſpoſitions of the cellulary membrane, being properly conſider'd, as affected by certain variations in the atmoſphere, would help us to inveſtigate the actions of the nervous fibres in the ſeveral different organs of the animal body. By the ſame rule we might judge of them in each individual. For which reaſon I repeat, that it is very improbable the nerves ſhould ſuffer as we find inanimate cords to do, from either a humid or dry atmoſphere. I mean as to tenſion and laxity. It is very true, that if the ſpring and elaſticity of the cellulary ſubſtance be impaired, the nervous fibrillæ will be conſtrained, and the effects of the electric fluid which animates them be impeded in its irradiations along them. As it alſo is more than probable that the cellulary ſubſtance having an influence on the tone and movements of the veſſels, it will follow, that its reciprocal action and reaction muſt keep up and ſuſtain the *tonic movements* of the whole ſtructure. So will the variety of theſe actions compoſe the different temperaments.

Something ſtill more worth our obſervation, is, that the cellulary membrane or ſubſtance is expoſed to certain accidental variations from the different temperatures of the atmoſphere. Either as to different climates, or the degree of the elementary principle. We find it ſuſceptible of many changes alſo, and thoſe from the different exerciſes of the vital functions, the mode of living, or the age of each particular perſon. The adult has more ſtrength and vigour than the child; males in general more than females. The huſbandman, more than the man of letters. Becauſe the cellulary membrane has a greater degree of denſity and firmneſs in the former than the latter. M. D'Aubenton remarks, that the different webs of the cellulary ſubſtance in lions have a reſemblance to tendons. In old perſons it is much more denſe and rigid than in youth. It is thus, in fact, the principle and flame of life become extinguiſhed by the exceſſive denſity of this ſubſtance in old men, which by impeding the different functions of the body, ſuffocates at laſt the ſenſibility of the organs. Theſe ideas are confirmed in ſome meaſure by a paſſage of Macrobius. *Hebeſcit uſus animæ denſitate corporis.*

The laſt obſervation which will be made on the cellulary membrane is the union of its fibres or webs on the whole line of ſeparation, or what the French anatomiſts call *raphè generale*, dividing the bodies of animals as it were into two equal parts. This biformed ſtructure is exceedingly conſpicuous in the cellulary ſubſtance of the ſkin. Whoever has made the moſt trifling diſſections in anatomy cannot be ignorant of this truth, on examining the union of the webs in the linea alba of the abdomen.

The whole cellulary ſubſtance being thus united, from the head to the feet, forms a line of ſeparation, by which the body is divided into two great regions. From this circumſtance each region ought to be conſider'd in a ſeparate manner, that is, as enjoying its own peculiar life, and circulation of its fluids. As poſſeſſing its own action, independent of the oppoſite region. This conſideration will enable us to explain ſome very uncommon phenomena in the animal œconomy. Such for example, as certain œdema, or the hemiplegia, which affect one ſide of the body only.

I ſhall beg leave to relate a few medical obſervations in ſupport of this aſſertion.

Obſervation the Firſt.

A young Man, of a pituitous habit of body, complained of ſhortneſs of breath, and, as he expreſſed it, a fluttering in the precordial region on the leaſt motion. If the exerciſe he took had been rather ſevere, he could ſcarce ſupport himſelf from falling. The leg of the ſame ſide was conſiderably ſwelled. Every medicine that could be thought of was adminiſtered to his relief, but in vain; his complaint continually gaining ground, put a final period to his exiſtence in about eighteen days.

His friends willing to know the cauſe of ſo unuſual a diſorder, deſired he might be open'd. The ſpleen was found to be conſiderably ſwollen and ſchirrous, his ſtomach was ſeemingly diſtended, but all the other viſcera in the moſt healthy ſtate. From theſe circumſtances the induration and tumefaction of the ſpleen, were ſuppoſed to be the cauſe of his death and of the ſwelling of the leg on the ſame ſide.

Obſervation the Second.

A Gentleman, of a ſtrong robuſt conſtitution, became paralytic of the whole right ſide. The animal heat was ſcarce to be perceived to the touch, the arm and leg being perfectly cold and inactive. The medicines moſt approved were adminiſter'd, but without any apparent ſucceſs, till towards the ſeventh day of the diſeaſe: at this time a critical ſweat began to manifeſt itſelf in the diſorder'd ſide, which continuing for two or three days, was ſucceeded by a return of ſenſibility and motion. On the fourteenth day the patient ſeem'd quite deliver'd from his complaint.

The ſtrongeſt confirmation of this peculiar diviſion of the body, and their general independence, was evident from the partial ſweat, which appeared only on the ſide affected. The healthy arm and hand remained in their uſual ſtate through the whole courſe of the diſeaſe.

Obſervation the Third.

I was deſired to viſit a labouring man, in the village of Road, about eight miles from Bath. He had been ill two days before I ſaw him, and complained of a violent headach, difficulty of breathing, pain in his ſide, and alternately of heat and cold. The pulſe of his left arm appeared to have a great degree of irritation, quick vibrations, and an extenſion of the middle of the artery.

The pulſe of the right arm ſeem'd to me as in the ſtate of health, regular and even, ſomething feveriſh but without variation in the dilation or contraction of the artery. As I perceived he had a ſmall moiſture on the ſkin, I thought it unneceſſary to let him be blooded, but order'd the pediluvia and a diaphoretic decoction. He ſweated profuſely in the night, and found himſelf ſomething better the next day. The variations in the pulſe of each arm ſtill continued. The pediluvia and decoction were repeated at night. I did not ſee him again 'till two days afterwards. The pulſe was calmer but ſtill varying. I gave him a purgative bolus, and order'd him ſtill to continue the uſe of the decoction. The purge was repeated four days afterwards. The fever left him, and the pulſations of the arteries in each arm were ſimilar.

I had obſerved a conſtant variation in the pulſe of each arm for the firſt four days of his illneſs, on the ſixth this variation was not ſo great: and at laſt the pulſations became ſo perfectly even in each artery that I could not perceive any difference, notwithſtanding I felt the pulſe of both arms at the ſame time.

Obſervation the Fourth.

I was deſired to viſit a young woman, aged twenty, in the village of Wolverton, near Bath, who ſeem'd to be in a ſlow hectic fever and maraſmus. She had caught a violent cold which had fixed itſelf in her eyes, and particularly the right, which was much inflamed. The palpebral glands were conſiderably ſwollen, and an ichorous matter iſſued out from them, which ran down the cheek. The pulſe of the right arm beat ſlow and unequal, at about forty pulſations in a minute. It was ſcarce poſſible to diſtinguiſh the pulſe of the left arm, ſo that I imagined at firſt the artery might be out of its uſual courſe, (which I have ſometimes known to happen,) but on preſſing the index finger, above the upper end of the radius, on the carpal bones, I could diſtinguiſh a few weak pulſations, neither ſo rapid or ſo quick as thoſe which I had felt in the right arm.

Obſervation the Fifth.

A labouring man had his whole body cover'd with critical eruptions. He imagined bleeding would be of ſervice, and loſt about ten ounces of blood. The eruptions diſappeared immediately, but from that moment he became weak and languid; he loſt ſtrength and appetite. To raiſe his ſpirits he had recourſe to ſtrong liquors, which threw him into a fever, accompanied with a ſore throat. He was reblooded. His throat became more painful after bleeding, and he ſwallowed even his ſaliva with great difficulty. On examining him I found the amygdal glands on the right ſide conſiderably ſwollen, and ſeveral ſmall white ſpots appeared on the ſame ſide within the mouth. The pulſe on the left ſide ſeem'd to beat with eaſe, but with frequent and rapid ſtrokes. That on the right ſide was ſmall, weak, and intermitting, the ſwelling in the throat turn'd to a gangrene, and the variation in the pulſe continued until his death.

Dr. Fouquet, in his *Eſſay on the Pulſe, obſerves, "That in the hemi-crania, and "certain pleuriſies, in which one ſide of the "breaſt only is affected; or perhaps only "one lobe of the lungs; the pulſe is exceed-

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* Eſſai ſur le Pouls. P. 112. C. xxi.

" ingly well characterized on the correſpond-
" ing wriſt to the organ which is affected,
" whereas it is but feebly marked upon the
" other ſide." The ſame obſervation reſpecting this diviſion of the body, has likewiſe been made by *M. de Bordeu, who mentions in his treatiſe on the mineral waters of the Aquitain, the caſe of a woman who died at Bareges of a cancer in the right breaſt. He found, on opening the body, that the whole right ſide of the matrix was intirely ſchirrhous.

It is more than we can poſſibly comprehend or attempt to explain, why the Almighty Creator has been pleaſed to give this biformed ſtructure to animals in general. It ſeems in ſome reſpect to contradict that univerſal law which he has impoſed upon nature. That law, I mean, by which the moſt ſimple plan is purſued to form the greateſt deſign. But if animals had but one eye, one ear, one noſtril, one arm, or one leg, their perceptions

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* Sic bareges aperto cadavere mulieris, cancro in mamma dextra jamdiu laborantis, pars dextra uteri ſchirrodea fuit.

Bordeu de Aq. Aquitan.

tions would not perhaps have been limited to only half what they are at preſent. For we find in ſuch animals as have loſt one of theſe organs, that the remaining one ſeems to become as it were doubly perfect. The loſs of one eye renders the optic nerve of the other more ready to perceive: and deafneſs on one ſide, is generally the cauſe of a much more acute ſenſibility on the other ſide.

But it may be aſked, why have they two kidnies, a double brain, a double ſcrotum, a double matrix? Why is the internal region of their bodies biformed, like their external ſtructure? Becauſe, if we may be allowed to conjecture, it ſeems probable, that the Almighty Being had, by this wiſe organization, lengthened out their exiſtence, and augmented their perceptions. Without this ſage and incomprehenſible ſtructure of their bodies, every hemiplegia would conduct us to the grave, every the ſlighteſt ſhock upon the extremities, (the arms and legs,) would be attended with the moſt fatal conſequences.

The demi-philoſopher will undoubtedly anſwer, that if animal bodies were triformed, their perceptions and exiſtence muſt then proportionably increaſe, and that the Divinity, by making them of ſuch forms, would have made not only man but animals more perfect. But let him conſider, that the ſame form of our bodies, two-fold as they are, would not be capable of exiſting on the earth, had the whole of their ſtructure been as capable of concentrating the *ætherial principle*, as the matter which compoſe our nerves. Not even Argus with his hundred eyes, or had he the addition of as many arms and legs, would be ſo perfect as that Being, the ſubſtance of whoſe body ſhould be form'd of the ſame matter, as is the optic nerve upon the retina. So that the excellent perceptions of animals do not ſo much conſiſt in the form, as the modification of the mucual matter of which they are conſtructed. The dog of Ulyſſes, by his refined ſmell, knew his maſter again although he had been abſent twenty years.

We are likewiſe to conſider, that this biformed ſtructure is not to be confined to the claſs of animals alone. We find it running through every leaf of the vegetable creation. It is apparent likewiſe in the general ſtructure of trees. In ſeveral reptiles, particularly the caterpillar, butterfly, flies, &c. the raphæ of their bodies is to be plainly diſtinguiſhed.

All theſe circumſtances put together ſerve to convince us that a very perfect analogy is to be found in every ſpecies of Beings in the whole circle of animated nature. As alſo that their perceptions are not entirely owing to their bulk. We have ſo great a proof of the contrary in what we obſerve in the tribe of inſects, that I connot help mentioning it. Some of them, whoſe volume is ſcarce equal to the fifteenth part of an inch, yet move with ſuch ſurpriſing velocity, that they paſs over twenty times their own length in one moment. And there are ſome, whoſe motions are ſo rapid, that could they be calculated, and were they to move continually, would paſs over a tract of ground equal to five hundred miles in one hour. We can aſſign no other reaſon for this great degree of ſwiftneſs in their motion, than the prodigious quantity of the electric fluid concentrated within and acting upon the mucus of which they are compoſed. As the Divinity has, however, proportioned every thing in nature to the ends for which they were created; ſo it is, that although theſe Beings move with ſuch velocity, yet they perhaps ſcarce paſs over a tract equal to five hundred yards in the compaſs of their whole lives.

CONSIDERATIONS

ON

MAN.

IF we were only to conſider the exterior form of man, we perceive, as in every other animal, a body fabricated by a certain ſymmetry. We obſerve a Being moved and directed by the different organs of which it is compoſed. If I carry my ſpeculations farther, I find that this animal ſpeaks, and in ſpeaking he expreſſes his thoughts. I obſerve, that his languge becomes, by a peculiar mechaniſm in the poſition of his words, not only the ſigns of his moſt ſimple, but alſo his moſt compoſed ideas. I remark an infinite variety in the combinations of his thoughts, a circumſtance not to be found in animals. This ſuperiority in man does not, however, appear to be a circumſtance of his peculiar organization alone. In the ape we find a tongue and its different appurtenances, a larynx, &c. conformable to thoſe of man. I obſerve certain birds articulating words very diſtinctly, ſuch as magpies, parrots, &c. Animals have a brain and a heart, they have different ways of expreſſing agreeable and diſagreeable ſenſations. In ſhort, man, when groſsly conſider'd, appears to be of the ſame claſs of Beings with animals. Mutually improved by the influence of ſociety, men, by aiding each other, riſe into greater perfection. Society refines the mental qualities, but the deterioration of his material organs, is a general conſequence of it. His perceptions may be more acute, but his bodily affections become impaired by a ſocial life.

Man therefore conſider'd as an animal is to be ranked with them and placed at their head; but when conſidered as a reaſonable Being, ſeems diſtinct from them all. He is more perfect, and this perfection conſiſt in two different cauſes.—The ſuperior organization of his brain and heart, and the ætherial and divine ſpirit, which we call his immortal ſoul. To examine into the nature of man, would be, therefore, to conſider him under the two points of view; of an animal, and reaſonable Being. To conſider the ſenſible elements of his organization and the diviſible parts of his exiſtence, ſeparately. The firſt has been ſhewn in our inveſtigation of the material principles of animals. The ſecond will be conſider'd in the following diviſion.—They correſpond with what has already been mentioned by various authors, under the names of enormon, ſenſibility, vital principle, animating principle, irritability, tonick and vital movements.

Following, therefore, the analytical order which was at firſt propoſed, we ſhall begin by the firſt apparent element of the human ſenſibility, or the ſenſations of man.

The matrix of the female, like every other organ of the human body, which either is, or has been in action, receives a ſlight orgaſmus, or a degree of ſpaſm. A voluptuous irritation ſeems to keep it in this ſtate, or to augment the degree of its ſpaſm. The cellulary ſubſtance, as Hervey has often obſerved, became red and ſwollen, previous to the venereal act: which conſiderably increaſed by the impreſſion of the male ſemen when impregnated. So far this celebrated anatomiſt obſerved, by diſſections made before and after copulation.

The ſeminal fluids of the male and female concentrated within the uterus, each containing their reſpective portions of that animating ſpirit, which we have found ſo analogous to the electric fluid, do probably act by their electric radiations on the chorion and amnios. It is more than probable, that theſe membranes are formed by that antagoniſm between the electric influence in the ſemen, and the generative powers of the womb, in the ſame manner as we obſerved that pellicles form'd themſelves on all mucual ſubſtances which had been heated; ſuch as milk, ſoups, &c. Theſe membranes are extended by the propulſive force, whilſt the warmth and natural heat of the uterus aid their expanſion, by leſſening the reſiſting powers. The fecundating powers of the uterus are firſt employed to collect together that liquid ſea of the colliquamentum, in which the *gonè* of Hippocrates is to eſtabliſh the rudiments of the future embrio. This firſt diviſion in the formation of the fœtus is, perhaps, the primitive attractive powers of the animated mucus, collecting together the firſt particles of the nervous ſyſtem, to form the cicatricula, medulla-oblongata, &c. The animating ſpirit concentrated in the human mucus, is the power which is to ſeparate or collect the various particles which are to complete the rudimental ſtructure of the Being It is as Galen obſerves; the artiſan which faſhions, engenders, and forms the different parts of the human body. Mercurius Triſmegiſtus calls it the ſpirit which vivifies every Being in the world, which directs and governs every thing, according to the dignity and merit of each.

The human fœtus is not perfectioned at one time, but paſſes through different gradations of its exiſtence. We have already obſerved them in the ſtructure of animals. It is the animating ſpirit, which is the firſt dawnings of the human ſoul, collected in every particle of the human mucus, that traces, like the painter with his pencil, the ſketch of every organ, whoſe deſign and model is imprinted upon it,—finiſhing in due order firſt the one and then the other.

The ſecond diviſion in the progreſs of the occult ſenſations of the human fœtus, (or rather its rudiments only) is what Hippocrates calls *cuèma*, or the conception.

The third diviſion in the formation of man, was call'd *embryon* by Hippocrates, and the fourth *paidion* and *couros*, or child.*

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* During may ſtay at Paris, the ingenious Abbè de la Favelle ſhewed me the various changes of the fœtus from the ſtate of embrio to the paidion or child. Before the rudiments of man were arrived at the ſtate of the paidion, or child, it conſiſted in a trunk without either arms or legs; the budding or expanding of which completed the ſtate of the embrio. He made this obſervation from the rudiments of the child found in the matrix of a young woman, which had been killed by accident, nearly, as ſuppoſed, about eight days after conception.—I remember to have ſeen a young man, at Figuiera in Spain, who had been born without the arms complete, probably they had never been able to expand themſelves, from ſome ſlight hurt which the fœtus might have received in the womb. It was certain he never had arrived at the perfect ſtate of a child, becauſe he was without arms, ſo that altho' he had attained the age of eighteen years, yet he ſtill remained in the ſtate of an embrio.

We find Hippocrates attributing conception to two cauſes: the healthy ſemen of the male, and a generative faculty of the matrix in woman; mentioned in the 62d and 63d aph. of the 5th ſection.—Wherever, therefore, ſuch properties as we have already mentioned are wanting in the mucus furniſhed by the male, or the matrix of the female is debilitated, or the animal heat in it diminiſhed, generation becomes imperfect. Such are the prediſpoſing cauſes. We ſhall next conſider how conception is completed.

The electric influence concentrated in the fœtus has hitherto been unconnected with that which governs the ſuperior exiſtence of the mother. The aſſemblage of the umbilical veſſels, into one large cord, and their union to the matrix, unite the life of the infant to the mother. From hence they act together, and become one and the ſame Being.

This ſenſation, almoſt purely ſympathetic, is the moſt occult of all the ſenſations of man. It ſcarce can be called an exiſtence, notwithſtanding it ſeems to be the firſt weak attempts of the embrio, to unite its own feeble dawnings of life to the more certain exiſtence of the mother. It is certain, however, how much the ſigns of conception have an influence on the ſentiment and will of the mother. A ſenſation of cold which ſhe feels run through her whole texture, the compreſſion of the matrix, and other manifeſt ſigns, indicate to the parent, the life and action of the infant, whoſe rudiments are ſewn and fecundated within her boſom. For the ſmall and almoſt imperceptible impulſe which the firſt ſlender ſketches of the fœtus is capable of exerting on the ſubſtance of the womb, is ſufficient to engage the attention of the mother, and to manifeſt to her by certain ſympathetic cauſes, its real exiſtence. In fact, ſo much ſo, as to excite her cares, and create in her mind thoſe tender and parental affections, which will afterwards increaſe as its life extends and manifeſts its exiſtence.

Conception then ſeems to be the firſt occult ſenſation by which the unformed Being unites itſelf to its parent. A ſenſation which is the pure reſult of the ſpiritual eſſence of human exiſtence, and depending on the exquiſite ſenſations of the fecundated uterus to receive and judge them. For the animated molecule can only as yet have received the firſt ſpark of his exiſtence, the reſult of which he is as utterly ignorant of, as he muſt be of ſounds and light before the formation of their reſpective organs, the eye and ear. For as the matter of our ſenſations continually exiſts, and the incitations of different objects are for ever active, we only begin to receive their impulſe when the reſpective organs unfold themſelves. It is equally as evident how limited the perceptive powers of ſuch a Being muſt be, whoſe organs are yet unformed, in compariſon to the actual exiſtence he is one day to enjoy. His exiſtence is occult, his ſoul undeſcribed, and the matter which is to animate him, receives a progreſs and perfection from the exiſtence of its mother. This is the opinion of the learned St. Auguſtin, that the reaſonable ſoul did not enter into the body of the embrio till the ſixtieth day after conception. And Ambroſe Parè has obſerved, likewiſe, that the ſoul did not properly belong to the child till after the formation of all the members. But it is neceſſary to conſider, that theſe authors did not deny the primitive exiſtence of a radical innate animating principle peculiar to the embrio: but meant the borrowed exiſtence derived from the mother. This is, more properly ſpeaking, what is meant by occult ſenſations. For we may ſometimes remark ſuch perceptions or the appearance of an animating principle in Beings which can never be capable of a degree of exiſtence ſuperior to that which is furniſhed to it by the womb. Such as moles and monſters, which move and ſeem to have a life, tho' they are entirely deprived of the faculties of reaſonable Beings. The occult ſenſations may therefore be conſider'd as the firſt gentle efforts of the undeſcribed fœtus, and as a natural and ſympathetic influence by which it appropriates certain parts of matter to its own eſſence, and rejects others. This predilection of matter is the immediate conſequence of the primitive ſenſation of the animal molecule. Every part of the human ſtructure being as yet untraced, or undeſcribed, it is impoſſible that the real ſenſations can participate, in the diſtribution of a matter, before the organs which is to direct them are formed and capable of action.

The chief of the ſenſations which we call occult, is to be conſider'd as the central power eſtabliſhed in the animal molecule. For

Now by this point of *appuy*, and the predilective powers of the embrio, it aſſembles certain parts of the colliquamentum to the general center, and eſtabliſhes the principium vitæ, in the firſt animated portion of exiſtence, call'd the *cicatricula*, or the nervous cylinder. But we are to remark, that the animal rudiments do no more than vegitate by the aid of the uterine warmth, and the approximating powers of the molecule. For by the ſame continuation of predilection and attraction, the various molecules of mucual matter unite, and form, by degrees, firſt the medulla oblongata, and the three bulbs which are to contain the different portions of the brain and organs of the ſenſes. The ſame actions continued, diſplay in their due period the various evolutions of the embrio. The organs of the ſenſes and the heart once formed, the ſenſations are no longer occult. For their powers do manifeſtly exiſt, tho' very imperfectly.

We can ſcarcely be allowed to conſider the ſenſations of the fœtus as active till the term of its birth, and the different inſpirations and expirations of the circumambient air have confirmed its real exiſtence, and put the diaphragmatic powers in motion. Nor are we to call them undetermined ſenſations, becauſe the organs on which they are founded are deſcribed in the embrio, and perhaps capable of receiving very gentle portions of thoſe incitations which are afterwards to confirm their more manifeſt exiſtence. The cardiac center once formed, the occult ſenſations are extended, but then they are, properly ſpeaking, groſs and corporeal ſenſations, which ſeem utterly unconnected with the governing and ruling principle of the ſoul. And although the fœtus may enjoy a vegitating principle, by which it determines certain affections of the mother, yet it does not appear that the corporeal ſubſtance of the perfect formed fœtus is capable, as yet, of poſſeſſing that ſublime principle which the ancients defined entilechia. That is to ſay, the interior perfection which moves or directs both the natural or voluntary action, and which gives life and movement to living bodies, by the conjunction and union of their parts.

The life of man may therefore be compared to the vegitative powers in plants, and his perceptions imitate the expanſion of flowers. The organs which are not yet called into action, are like the buds.

The life of the fœtus in the matrix, is manifeſtly different from that which it is to enjoy when it enters into the world. Several of his organs, which are very eſſential to to his nature, diſcloſe themſelves but late. The lungs remain inactive in the matrix. The ſtomach often governs the whole animal œconomy in the child. In the age of puberty the expanſion of the generative organs cauſe the greateſt revolutions to the human conſtitution. The perceptive powers of the mind extend themſelves likewiſe. Human life is therefore the combination and reciprocal action of all the organs of the human body.

The firſt dawnings of life in the child, (after it has united its exiſtence with that of the mother,) is probably no more than the feeble efforts of the heart and brain, to diſtribute the animating eſſence towards the rudiments of the various organs. The lungs not yet in action, are, as we are told by Avicennes, nouriſhed by a red blood, for which purpoſe there is a hole in them which communicates from one veſſel to another, and is ſtop'd up ſo ſoon as the child is born. This hole is what the French call *le trou de botal*. There is ſtill another which ariſes from the vena cava, and inſerts itſelf into the right ventricle of the heart, juſt above the right auricle, communicating with the pulmonary vein. The blood by this means circulates, from the vena cava, into that of the lungs, and is hindered from flowing into the cava, by valves, ſo that it does not paſs through the lungs, or enter into the left ventricle of the heart. When the child is born, they are ſtop'd up, becauſe the air entering in and dilating the lungs, open a new paſſage for the blood, thro' which it is to circulate during the life of the Being.

It is by ſuch wonderful mechaniſm, that the child is capable of exiſting in ſo denſe an element as that in which it ſwims, during its exiſtence in the uterus of the mother. Certain adults in whom theſe holes have ſtill remain'd open after their birth, were look'd upon as preternatural Beings, 'till anatomy diſcover'd the cauſes of ſuch peculiarities. —Theſe men, who were found to differ in no manner whatſoever as to their external ſtructure from others, could yet dive to the bottom of rivers, and remain for hours together under the water, without receiving the leaſt hurt. No wonder then, that in the days of ignorance and ſuperſtition, they ſhould be look'd upon by the uninſtructed multitude, as evil ſpirits, fiends and witches. —From hence perhaps ſprung up that barbarous cuſtom of trying them by water, &c. not wantonly undertaken, becauſe they had obſerved certain perſons, (ſuch as theſe I have juſt mentioned) whom it was not poſſible either to drown or hang.

There ſeems to be this peculiarity in the growth and expanſion of the animal faculties of man, that thoſe organs which are not yet expanded, or of immediate uſe to the fœtus, are more immediately nouriſhed by the blood of the mother. It is not ſo in the egg. We obſerved before the heart was completely form'd, that the ſame warmth occaſioned the due degree of fermentation in the humors of the chicken, and that the purple ſtreams ruſhed on to meet the heart, that they might be diſtributed to every organ, by the action of this muſcle. In the fœtus the blood of the mother conveys the animating ſpirit to thoſe parts which want its aid, and which cannot yet be ſupplied from the organs of the child.

The ſtate of the fœtus in the womb, more particularly ſo the early period of it, appears to be no more than a ſimple vegitation of thoſe organs which are to direct his exiſtence when he comes into the world. The whole of his preſent exiſtence may be compared to thoſe mutual reactions which we obſerved in the ſtate of molecule. In the matrix he is as it were an imperfect animal. The lungs do not expand to the influence of the air, and the heart only moves by an inſtinct peculiar to the fœtus, becauſe the umblical arteries furniſh him with arterial blood from the mother, and with it the animating ſpirit of life for thoſe organs to which it is diſtributed, —The fœtus has therefore a life peculiar to itſelf, but ſo occult in the primitive ſtate, that its chief exiſtence depends upon the mother. Galen tells us, in his book on the formation of the fœtus, "That the embrio "vegitates like the plant, having no occaſion "for the action of the brain and heart, more "than it has for the ears and eyes." He ſays, likewiſe, that the fœtus ſhould be conſider'd as part of the mother.

We have daily proofs continually offering themſelves to our conſideration, to confirm the imperfect ſenſations of the fœtus in utero. We have, likewiſe, as evident marks of its undetermined ſpiritu-eſſence in theſe manifeſt impreſſions which the will or inclinations of the mother are capable of exciting on it. In the earlieſt ages of the world we find uncommon marks born with children, and authors attributing their cauſe to the imagination of the mother. Thyeſtes was mark'd with craw fiſh: Deleucus bore the reſemblance of an anchor on his thigh. Galen tells us in his Lib. de Theriaca, Ch. 10. "An Ethiopian "conſulted him on the beſt method to have "pretty children; I adviſed him to hang "ſome handſome picture at the feet of his "bed, and to tell his wife to look upon it "very attentively during the venereal act: "he followed my advice, and the event "turn'd out as he wiſh'd." St. Jeremy, in his Quæſt ſuper Geneſin, tell us, that a woman was ſuſpected of adultery, becauſe the child did not reſemble the father, excuſed herſelf by ſaying it reſembled perfectly the picture which hung at the feet of her bed, and on which ſhe had conſtantly fixed her eyes when with child.—A woman in the neighbourhood of Piſa, in Italy, was brought to bed of a child cover'd with hair: ſhe ſaid it was owing to her looking continually at the picture of St. John the Baptiſt. If we may believe Heliodorus, who wrote in the time of Horace; Perſina, the queen of Ethiopia, conceived from her huſband Hyduſtes, (who was alſo an Ethiopian,) a white girl: ſhe attributed this uncommon circumſtance to a picture of Andromeda, which hung before her eyes, and on which ſhe fixed them during the cytherean volupté.

Pliny, in his Natural Hiſtory, Ch. 1. and 12. Lib. 7. mentions ſomething to this purpoſe.—Fernelius, in his Phiſiology, Ch. 12. Lib. 7. attributes all theſe circumſtances to the imagination of the mother, and ſays, that the generative faculties of the uterus are directed and governed by it.

The obſervations which the celebrated Mr. Haller brings in ſupport of this argument, are the moſt ſatisfactory. From the known character of that gentleman, he cannot be ſuſpected of intending to deceive the world, by relating events which have not the ſanction of truth. Among the many obſervations, the moſt remarkable are, of a woman being ſhocked by ſeeing a beggar with a hair-lip, and the palate ſplit, brought her child into the world with a hair-lip and the palate ſeparated.

A woman with child fell into a cellar, and wounded her head; the child was born with the ſame marks, on the correſponding part of the head.

A woman at Paris, big with child, went to ſee an aſſaſſin broke alive upon the wheel; her child came into the world with ſimilar fractures on the limbs that ſhe had ſeen the executioner make upon the criminal.

By conſidering, as we have done, that the mother and child form but one Being, when united by the placenta, it will be an eaſy matter to comprehend how much the affections of the former muſt have an influence on the latter. Whatever object may ſhock the ſenſible nerves of the fecundated matrix, muſt of neceſſity be communicated to the placenta, and from thence to the fœtus. By ſuch ſhocks, the correſponding members in the feeble infant will be agitated, and the currents of the ætherial principle obſtructed. Hence muſt follow either an abolition of the animating ſpirit in them, or a defect in their organization. The feeble dawnings of the ſoul in the fœtus being grafted, as it were, upon the entilechia of the mother.—The idea of horror, connected with the part which ſuffers, making a ſtrong impreſſion on the imagination of the mother, force the nerves which give the movement to that part, and affect them by very powerful ſpaſms. The compreſſion of the tender nerves of the infant, impede the irradiations of the animating ſpirit along them. Such ſhocks upon the ſoft pulpy ſubſtance of which the fœtus is as yet compoſed, occaſion ſuch a change in their manner of exiſting, that they can neither increaſe, or receive the nutritive principle. The vital principle which ſhould be diſtributed to thoſe organs, is impeded in its courſe. Hence they wither and decay. If the ſhock has been confined to one part, then perhaps only a ſmall diſcoloration of the ſkin may happen, which nurſes call marks.—This may eaſily be reconciled to experience and obſervation. A wound upon the ſkin, or a bruiſe, leave the grumous blood in the cellulary membrane, which turns black. In women, and perſons whoſe conſtitution is exceedingly delicate, black or blue ſpots appear from the ſlighteſt touch or ſqueeze; no wonder that the pulpy and yielding ſubſtance of the fœtus ſhould be affected by the ſlighteſt ſhocks. It is therefore more than probable, that marks and monſters are real effects produced in the womb by ſundry accidental cauſes.

M. Vandermonde, in his *Eſſai ſur la manière de perfectionner l'Eſpece Humain*, ſuppoſes that children not only inherit the ſentiments and inclinations of their parents, but alſo their virtues and their vices. This circumſtance is conformable to what was mentioned when ſpeaking of the generative powers. He has made a remark, which if not always conformable to obſervation, at leaſt may be allowed to be curious. "It may commonly "be remark'd, ſays our author, that the elder "children are more inclined to libertiniſm "than the younger; it is, without doubt, "becauſe they were begotten in the youth- "ful and amorous ages of their parents, and "are conſequently more expoſed to every

" impreſſion they receive by the ſenſes:
" whereas the younger children are com-
" monly more diſcreet and more eſteemed."

To return to our ſubject. The fœtus uniformly increaſing by the ſame laws which we have already mentioned, arrives at length to that ſtate of its perfection, ſo as to acquire a degree of force ſuperior to what his narrow priſon will admit. The weak efforts of the child, aided by the powers of the mother, give him his entrance into the world. The ſeparation of the umblical veſſels deſtroy his union with the mother, and he now begins to live as a ſeparate Being.

We are arrived, at length, to that period in which the ſenſations do exiſt, tho' imperfectly, and on which account they are ſtill to be claſſed under the title of imperfect ſenſations in man. The new-born infant is really ſubjected to the ſame impulſions from external objects as the adult. The air dilates his lungs, and acts upon the exterior organ of the body. Sounds do, perhaps, gently ſtimulate the auditory nerve; or light, the retina: but then theſe impreſſions in the infant are not realized, becauſe not only the organs of the ſenſes remain as yet imperfect, but the due reaction between the phrenic centers and the brain is not yet accompliſhed. The ſenſations may be received in the brain, but they cannot yet be judged in the heart.

The ſame cares which participated in bringing the infant into the world, now ſupply him a nouriſhment. He ſucks the rich nectar of his exiſtence from his parent's boſom, and in her heart he finds engrafted the tendereſt affection, to protect his helpleſs infancy. Until the age of thirteen years, the ſtomach ſeems to predominate over the other organs of the body. Arrived at the age of puberty, he begins to ſcrutinize the various objects by which he is ſurrounded, with more firmneſs. His attention is moſt attracted by the expanding beauties of his fair companion. He obſerves in her eyes a ſparkling vivacity, and remarks in her air and deportment a peculiar grace and elegance. Whenever Strephon meets his Phillis, he feels ſome unuſual ſenſations in the precordial region. If he plays with the rich treſſes of her auburn hair, obſerves the ſwelling of her ſnowy boſom, preſſes her tender hand, or ſips the balmy moiſture of her lips, his heart beats with unaccuſtomed eaſe and frequency, his ſpeech becomes laboured, and the electric fluid being agitated, *emblazes* his whole ſtructure. He find himſelf attached to her by an invincible ſympathy; uneaſy when ſhe is abſent from him, and always ſeeking to be preſent with her. Such ſenſations which he has not felt before, do, as it were, new model his exiſtence. Forgetting his puerile amuſements, he becomes careful of his dreſs, his manner is more tender, and his expreſſions ſtudied and affectionate. Phillis, in her Strephon, ſees the monarch of her ſoul: Strephon, in his Phillis, the delight of his heart. Mutual vows of tenderneſs are reciprocally interchanged, and the whole circle of their wiſhes are center'd in themſelves.

Now we come to that age, in which man enjoys the ſublime treaſures of providence, in which every organ being perfected, afford him the rich felicity of an aſſured exiſtence. He breathes in the ſummer of his youth, and perceives and judges by the moſt refined ſenſations. This ſhort and flattering age, is what we all wiſh to enjoy and ſeem ſorry to leave; but the ſame paths which led us to it, will conduct us to another; if not ſo brilliant yet more to be eſteem'd. It is on old age, that we are to ſhed our incenſe and our offerings to thoſe parents who have protected us in our helpleſs ſtate. It is to them that we are now to repay the grateful taſk of protection, and form the moſt pleaſing aſylum for their enfeebled years.

Old age offers us the picture of the ſmoothed ſea, after the raging ſtorm, in which, when the youthful part of life has been prudently ſpent, we taſte the moſt ſolid pleaſures. Far from dreading the approaching hand of death, we ſink imperceptibly, into a long and peaceful ſleep.

FINIS.

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BRITISH MU

CORRIGENDA.

Page 22. *line* 19 and 20. *for* depend, *read* depends; and *f.* it is them, *r.* it is they. *p.* 37. *l.* 18. *f.* them that wake, *r.* that are awake. *p.* 38. *l.* 2. *f.* enable it, *r.* enable them. *p.* 41. *l.* 3 and 13. *f.* Anaxagorus, and Gleſion, *r.* Anaxagoras, and Gliſſon. *p.* 48. *l.* 1. *f.* the origin and formation of things to proceed, *r.* that the origing and formation of things proceed. *p.* 51. *l.* 4. *f.* which was, *r.* which were. *p.* 64. *l.* 3. *f.* uninformed, *r.* unformed. *p.* 74. *l.* 1. *f.* was in its, *r.* it was in its. *p.* 83. *l.* 3. *f.* vegetal, *r.* vegetable. *p.* 121. *Latin note*, *r.* Fieri enim poteſt ut in tactis ſiniſtris, &c.—Vid. conſil. lib. 2. T. 3. P. 51.

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